

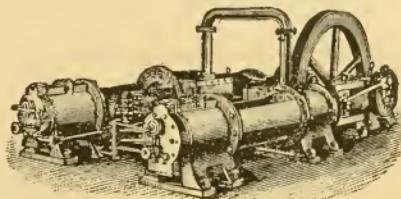
INDEX  
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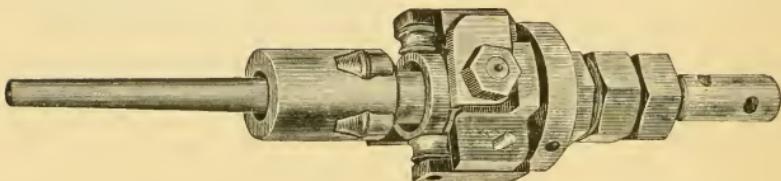
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E. Miller  
Aug 1893

# GALLOUPE'S GENERAL INDEX

TO

# Engineering Periodicals,

FROM 1888 TO 1892, INCLUSIVE.

COMPRISING

*ENGINEERING; RAILROADS; SCIENCE;  
MANUFACTURES AND TRADE.*

BY

FRANCIS E. GALLOUPE, M.E.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, S.B.; MEMBER AMERICAN  
SOCIETY OF MECHANICAL ENGINEERS, ETC.

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## VOLUME II.

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BOSTON:  
30 KILBY STREET.  
1893.

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BOSTON, MASS.

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FROM THE PREFACE TO THE FIRST VOLUME.

PROGRESS in the development of material resources, in recent years, has created a large and increasing volume of engineering literature in periodicals which contain valuable papers and information, much of which is too recent, or fragmentary in character, to be found in books, or elsewhere.

This work is designed to make accessible to engineers in all branches of the profession, to special investigators, librarians, editors and others, the more important papers and articles contained in leading American and English periodicals during the last five years. To keep the list from becoming unwieldy, it was decided to limit, besides the period covered, the number of periodicals, and with these restrictions the compiler has selected each reference given by personal examination of the articles in the files.

The index is by subjects, alphabetically arranged, and makes available information now practically buried in the mass of engineering literature, or only to be extracted by the aid of some one hundred and fifty indices, and the loss of much time.

BOSTON, *May*, 1888.

## P R E F A C E.

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THE purpose of this Index is to supply a reference list to the important works and matters relating to engineering and its allied interests, during the period covered. It is believed that no other index fills the field of this work, which shows at a glance the principal information published on any given subject in the leading periodicals during the past five years. The periodicals indexed having been selected from a list of over one hundred and sixty periodicals will, it is thought, sufficiently cover the field of practical engineering, as nearly all important works and matters are contained among these representative papers. Foreign papers are represented by translated articles reprinted in the periodicals indexed, and there are besides incidental references to numerous others.

Within the limits set, the aim has been, by a critical examination of each article throughout the files, to preserve references to all those of permanent technical value, or practical use.

BOSTON, *June*, 1893.

## ABBREVIATIONS.

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<i>addr.</i>	address.	<i>discov.</i>	discovery.
<i>agric.</i>	agricultural.	<i>discuss.</i>	discussion.
<i>Am.</i>	American.	<i>distil.</i>	distillation.
<i>amt.</i>	amount.	<i>distrib.</i>	distribution.
<i>anal.</i>	analysis.	<i>dyn.</i>	dynamometer.
<i>ap.</i>	apparatus.	<i>econ.</i>	economy, economical.
<i>aqued.</i>	aqueduct.	<i>effic.</i>	efficiency.
<i>atmos.</i>	atmosphere.	<i>elec.</i>	electric.
<i>aut.</i>	automatic.	<i>eng.</i>	engineering.
<i>bat.</i>	battery.	<i>es.</i>	estimate.
<i>Bess.</i>	Bessemer.	<i>estab.</i>	establishment.
<i>Brit.</i>	British.	<i>evap.</i>	evaporation.
<i>bull.</i>	bulletin.	<i>exam.</i>	examination.
<i>cal.</i>	calculating, calculation.	<i>excav.</i>	excavating, excavation.
<i>capac.</i>	capacity.	<i>exhib.</i>	exhibition.
<i>cath.</i>	cathedral.	<i>exp.</i>	expense.
<i>C. E.</i>	civil engineer.	<i>expt.</i>	experiment.
<i>Cens.</i>	Census.	<i>frt.</i>	freight.
<i>centrif.</i>	centrifugal.	<i>galv.</i>	galvanometer.
<i>chem.</i>	chemistry.	<i>gov.</i>	governor.
<i>condens.</i>	condensing, condensation.	<i>h.</i>	house.
<i>cor.</i>	correspondence	<i>h. p.</i>	horse power.
<i>corrug.</i>	corrugated.	<i>hist.</i>	history.
<i>Corp.</i>	Corporation.	<i>hor.</i>	horizontal.
<i>Co's.</i>	Companies.	<i>hos.</i>	hospital.
<i>cyl.</i>	cylinder.	<i>ht.</i>	height.
<i>dec.</i>	decrease.	<i>hydr.</i>	hydraulic.
<i>dept.</i>	department.	<i>illum.</i>	illuminating.
<i>des.</i>	designer, design.	<i>imp.</i>	improvement.
<i>desc.</i>	description.	<i>inc.</i>	increase.
<i>diam.</i>	diameter.	<i>incand.</i>	incandescent.
		<i>indus.</i>	industry, industrial.

## ABBREVIATIONS.

<i>ins.</i>	insurance.	<i>R.</i>	railroad.
<i>Inst.</i>	Institute.	<i>recip.</i>	reciprocating.
<i>inv.</i>	inventor, invention.	<i>refrig.</i>	refrigerating.
<i>locom.</i>	locomotive.	<i>rep.</i>	report.
<i>M. E.</i>	mechanical engineer.	<i>resist.</i>	resistance.
<i>mach.</i>	machine, machinery.	<i>Ry.</i>	railway.
<i>manuf.</i>	manufacture.	<i>san.</i>	sanitary.
<i>max.</i>	maximum.	<i>sec.</i>	second.
<i>min.</i>	minute.	<i>Soc.</i>	Society.
<i>mo.</i>	motive.	<i>spec.</i>	specification.
<i>mt.</i>	mountain.	<i>sq.</i>	square.
<i>munic.</i>	municipal.	<i>st.</i>	street.
<i>mut.</i>	mutual.	<i>stat.</i>	statistics.
<i>n.</i>	note.	<i>str.</i>	steamer.
<i>nav.</i>	navigation.	<i>sup.</i>	supplement.
<i>obs.</i>	observations.	<i>teleg.</i>	telegraph.
<i>pass.</i>	passenger.	<i>teleph.</i>	telephone.
<i>pat.</i>	patent.	<i>temp.</i>	temperature.
<i>pneu.</i>	pneumatic.	<i>topog.</i>	topographical.
<i>pop.</i>	population.	<i>util.</i>	utilization.
<i>por.</i>	portrait.	<i>vac.</i>	vacuum.
<i>pph.</i>	pamphlet.	<i>vel.</i>	velocity.
<i>pro.</i>	proceedings.	<i>ventil.</i>	ventilation.
<i>proc.</i>	process.	<i>wrt.</i>	wrought.
<i>prog.</i>	progress.	<i>wt.</i>	weight.
<i>pyrom.</i>	pyrometer.		

## NAMES OF PERIODICALS INDEXED,

WITH THEIR ABBREVIATIONS.

- Cassier's Magazine. *Cassier's*  
Electrical Engineer, N. Y. *El Eng*  
Electrical Review, London. *El Rev Lond*  
Electrical Review, N. Y. *El Rev*  
Electrical World, N. Y. *El Wld*  
Engineer, The, London. *The Eng*  
Engineering, London. *Eng*  
Engineering Magazine, N. Y. *E Mag*  
Engineering and Mining Journal, N. Y. *E & Min*  
Engineering News, N. Y. *E News*  
Engineering Record, N. Y. *E Rec*  
Journal of the Franklin Institute, Phila. *F Inst*  
Power, N. Y. *Pwr*  
Proceedings of the Institution of Civil Engineers, London.  
    *Inst C E*  
Proceedings of the Institution of Mechanical Engineers, London.  
    *Inst M E*  
Proceedings of the Society of Arts, Boston. *Soc Arts Mass*  
Railroad and Engineering Journal, N. Y. *R & Eng*  
Railroad Gazette, N. Y. *R Gaz*  
Scientific American Supplement, N. Y. *Sc Am Sup*  
Street Railway Journal, N. Y. *St RJ*  
Technology Quarterly, Boston. *Tech Q*  
Transactions American Institute of Mining Engineers, N. Y.  
    *Am Min*  
Transactions American Society of Civil Engineers, N. Y. *Am C E*  
Transactions American Society of Mechanical Engineers, N. Y.  
    *Am M E*

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## OTHER PERIODICALS INCIDENTALLY INDEXED IN PART.

American Engineer; Annales des Ponts; Building News, London; Century Magazine; Cosmopolitan Magazine; Forum; Le Genie Civil; Harper's Monthly; Industries; Iron Age; Journal of the Assoc. of Eng. Societies; The Locomotive; New England Magazine; Nineteenth Century; North American Review; Scribner's Magazine, etc.

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- Alcoholometer**, Siemen's *Eng* \* July 22-**92**
- Alden** George I., por. *Cassier's* \* May -**92**
- Algebra**, lessons in *Pwr* files -**91**-**92**; determinant theorems applic., Tyler *Tech Q* Nov -**90**
- Alkali** process, ed. *Eng* Apr 13-**88**; trade, British, notes *E & Min* Sep 13, 20-**90**, (full) Apr 11, \* 18-**91**; works, analytical methods for, Lunge Feb 14-**91**, *J. Soc Chem Ind.* See also under CHEMISTRY; NITRATES
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- Alloyage** and igneous cementation, Elbers *E & Min* Nov 16-**89**
- Alloys**, strength, Unwin *Eng* Oct 4-**89**; Roberts-Austen Mar 16, 23, Apr 6-**88**, do. research committee report Nov 6, 6, \* 13-**91**; do. properties (full) *E & Min* \* Apr 9, 16-**92**; strength at different temps., Unwin Jan 11-**90**, do. *The Eng* Oct 4-**89**; new and eng. applics., Garrison *F Inst* \* June, July, \* Aug, \* Sep -**91**; Robert's report discuss., insets (full) *Inst M E* \* Oct -**91**
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- ALUMINUM**, and alloys, relative value, Pemberton *El Rev* Oct 6-**88**; manuf. in electric furnace, Dagger *El Rev Lond* Sep 27-**89**; copper and manganese, properties, Cowles, abs. *Inst C E* v 106-**91**, *E & Min* July 11-**91**. See also ALUMINUM alloys
- BEARING** metal, Dudley *F Inst* Feb, Mar -**92**, *Sc Am Sup* Apr 2-**92**
- CHROMIUM** and iron, Hadfield (full) *Eng* Sep 23, 30, 30, \* Oct 7, 14-**92**; chrome pig iron and steel, Brustlein *R & Eng* Aug -**88**
- ELECTROLYTIC** decomposition and preparation, Roberts-Austen *El Wld* \* Feb 4-**88**, Warren *Sc Am Sup* Mar 5-**92**
- FERRO-chrome**, Brustlein, *E & Min* Feb 1-**90**; iron and silicon, Hadfield *Eng* Oct 18, 25-**89**
- MANGANESE**, copper and aluminum, properties, Cowles, abs. *Inst C E* v 106-**91**, *E & Min* July 11-**91**
- NICKEL** and iron, magnetic properties, Hopkinson *El Rev Lond*

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**Alphand, Jean C. A.** *Inst C.E.* v 107-92

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- Anderson**, Henry J. C. *Inst C E* v 106-**91**
- Anemometers** testing, Gieseler *E Rec* \* July 13-**89**
- Angle**, the economical, Honey *Sc Am Sup* \* Jan 17-**91**
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- PRISMS**, Gieseler *E News* \* May 12-**88**
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- Antarctic** exploration, Griffiths (full) *Sc Am Sup* Jan 10-**91**
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- Aransas** Pass, Texas, imp. *E News* \* Aug 30, Haupt, cor. \* Sep 13-**90**
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- Arch**, Arthur J. E. *Inst C E* v 101-**91**
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- EQUILIBRIUM**, curves, Suplee *Am M E* \* v 11-**90**
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**APARTMENT** house, Yosemite, N. Y., entrance *E Rec* \* June 27-**91**

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- Architecture**, CHURCH at Chateauneuf (Charente), France, inset *E Rec* \* Sep 19; of St. Paul, Dax (Landes), France \* June 6-91
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- COUNTRY houses, Cambridge, etc., inset *E Rec* \* Jan 17-91; Cohasset, Mass., interior, inset \* Apr 23-92; English, inset \* Aug 29-91; Arthur Little's, Boston, inset \* Feb 20; Geo. Macculloch, Morristown, N. J., inset \* Mar 26; Marblehead Neck, interior, inset \* Jan 16-92; Swampscott, Mass., inset \* Aug 15, Elihu Thomson's do , inset \* May 9-91
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- GALLERY Victor Emanuel, Milan, inset *E Rec* \* July 30-92
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- MEAT market, old, Haarlem, Holland, inset *E Rec* \* Feb 14-91
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- MUSEUM building and arrangement, Ferrec *E Mag* \* Nov -91; Amsterdam, Holland, inset *E Rec* \* Feb 28; Hague, do , inset \* May 23-91
- MUSIC Hall, N. Y., main entrance, inset *E Rec* \* Feb 13-92
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- Arctic** exploration, Peary expedition, Nansen's No. Pole exped. *Sc Am Sup* \* Nov 26, 26-92
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- Argall**, Philip, por. *E & Min* \* Dec 5-91

- Argentine** Republic, ed. *Eng* Dec 27-**89**; finance *E & Min* Apr 20-**89**; R. map *E News* \* Dec 8-**88**; Jan 26-**89**; notes, Shunk, Feb 22, Mar 22-**90**; wheat in *Sc Am Sup* Apr 14-**88**
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- Arkansas** mines, Branner, *E & Min* Oct 20-**88**
- Armada** (Spanish), defeat in 1588 *Sc Am Sup* \* Aug 25-**88**
- Armor**, cellulose *E News* Dec 1-**88**, steel, tests at Annapolis, Sep 20, 27 \* Oct 4-**90**. See also GUNNERY and armor
- Arms** and armor of ancient Japan, Baba *Soc Arts Mass.* -**88**
- Army**, Austro-Hungarian, Kuhn *Harper's M* \* June; Italian, Goiran \* Aug -**92**; European armies, Dodge *Forum* July -**92**; of Kukuanaland, Michaelis *Sc Am Sup* Oct 26-**89**, *F Inst*
- Arrol**, William, por. *Eng* \* Feb 28-**90**
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- Arsenic** determination, Canby *Am ME* v 17-**89**, Birm May -**88**; *Locom* June -**92**
- Art**, fine, composition and selection of a subject, Ellis *Sc Am Sup* \* June 1-**89**; use of cloisonne for decoration, Heaton (full) May 9; pictures, durability painted with oils and varnishes, Laurie June 20; Miller, Aug 22; decorative treatment of natural foliage, Stannis (full) \* Nov 21, 28 \* Dec 5, 19, 26-**91**
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- Artificial** limbs, Mark's *F Inst* \* May -**89**
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- Arts** and manufactures, prog. rev. *F Inst* Feb -**88**. See also SOCIETY of Arts, London
- Asbestos** *E & Min* Jan 2-**92**; Rogers *Sc Am Sup* June 16-**88**; Canadian industry *E & Min* Sep 17-**92**; chem. composition, Donald, June 27-**91**, do. *Sc Am Sup* July 18-**91**; mining, Quebec, Ells *E & Min* Apr 25-**91**, Canada, abs. *Inst CE* v 107 -**92**, *Am Gas Lt J* Oct 26-**91**; U. S. production, Parker *E & Min* Sep 5-**91**, *Cen Bull*; mining, manufac. and uses, Fisher *The Eng* Dec 16-**92**

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**ARCTURUS**, recent conceptions, Knight, *Sc Am Sup* July 4 -**91**

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- Astronomy**, MARS, map *E News* \* May 18-**89**; physical aspects, map *Sc Am Sup* \* Sep 8-**88**; *Science*, do. and views, Proctor *Sc Am Sup* \* Oct 18-**88**, *Knowledge*; opposition, Lockyer *Sc Am Sup* \* Oct 15-**92**
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- METEORITES, meteors *Locom* July -**90**; August *Sc Am Sup* Oct 18-**88**; notes, Lockyer (full) \* Feb 2; and what they teach, Hensoldt, Nov 16, 23-**89**; Wash. Co., Kan. Aug 23-**90**; meteoric finds, Foote, Feb 6-**92**; *Nature*; *Science*. See also ASTRONOMY, comets.
- MILKY way, Gore *Littell's* Apr 30-**92**
- NEPTUNE, discovery (great discoveries) *Locom* Dec -**89**
- OBSERVATORIES, Levander *Sc Am Sup* Aug 29, (full) Sep 5-**91**; Halsted ob. spectroscope *Eng* \* July 22-**92**; Pekin ob. *Sc Am Sup* \* Jan 12-**89**; Warner ob. *Eng* \* Jan 27-**88**. See also ASTRON., Lick-Sayre observs.
- SAYRE observ., Beth., Pa., deflection of plumb line at, Frescoln *Lehigh Eng J* June -**88**
- SPACE, constitution of, Hirn, bk. review *Eng* Nov 8-**89**, do. *Sc Am Sup* Jan 11, do. De V. Wood, Apr 5; the grants of starry space, Jan 25-**90**
- SOLAR spectrum, limit of, Hartley *Sc Am Sup* May 4-**89**, *Nature*
- STARS, in handle of big dipper, simultaneous culmination method, Marcy *E News* \* Sep 5-**91**; two extraordinary, Pickering *Locom* \* June -**90**; double \* Oct -**91**; age of the, Janssen *Sc Am Sup* Jan 28, Feb 4-**88**; distances, Oudemans, Mar 8-**90**; double and multiple, Knight, Oct 8-**92**
- TELESCOPES, photographic equatorial, Melbourne observ. *Eng* \* Dec 19-**90**; clock-driving ap., Grubb, insets *Inst ME* \* July -**88**. See also TELESCOPES.
- URANIA Institute, Berlin (Lick observ.), Holden *E Mag* \* Mar -**92**; planet Uranus, Gregory *Sc Am Sup* Aug 24-**89**
- VENUS planet *Sc Am Sup* \* Nov 12-**92**
- Atchison**, Arthur T. *Inst C E* v 105-**91**
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- Atlantic coast, subsidence of, *Sc Am Sup* Aug 22-**91**; navigation, prog., ed. *Eng* June 20, 27-**90**
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SCHALEHN's fire-bridge *The Eng* Jan 13-88

SELLERS. See BOILERS, water-tube, Seller's

SEMI-locomotive *El Rev Lond* \* May 27-92. See also PORTABLE boilers and engines

SERPOLLET'S instantaneous generator, *El Wld* \* Nov 23-89; Kennedy, expts. *Eng* Sep 18-91. See also STEAM carriage, Serpollet's

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STEAM pipes connections *Locom* \* Aug -90

STRENGTH of shells, expts., J. Scott *Eng* \* Apr 26-89; stay, Yarrow's tubular \* Nov 7-90; short, strength of \* Apr 17, cor. \* May 15-91; stay-bolts prob., ed. *E News* Mar 21-91; new steel boiler, expt. test, Scott *Locom* June -89; heads, un-braced wrt. iron \* Feb; hydr. tests, Nov -90; bursting pressure \* Feb, stayed surfaces (full) \* Mar -92; bracing and stay-bolts *Pwr* \* Sep -91; bursting pressure of cylindrical *Sc Am Sup* \* Mar 26-92. See also BOILERS, bracing—riveted joints STOKERS, aut. conveyor *Eng* \* June 14, 28-89; plant with, Curtis Davis, Cambridge, Mass. *E News* \* Dec 1-92; machine stoking, discuss., insets *Inst CE* \* v 104 -91; Roney stoker *Pwr* \* Aug -89; mechan., Whitham (full) \* July -91, Roney *St RJ* \* Aug -89; mechan., Roney (full) July -91. See also MECHANICAL stokers

TESTS and trials, expts., Donkin *Eng* July 4 \* 18 \* Aug 1 \* Nov 21-90 \* Feb 27, May 15 \* Oct 2-91 \* Mar 18 \* July 22 \* Oct 21-92; and fuel econ., Holliday, inset *Inst CE* \* v 92-88; overheating expts., Hirsch, abs. v 108 -92, *Bull Soc E Soc* -90; Otis Co's mills, Ware, Mass. *Locom* \* Mar, equiv evap. Apr -90; clean and foul boilers, comparative, July -92; duty, factors of evap., table *Pwr* Feb, Mar, May, Sep -89, how conducted \* July -92; Barrus, bk. review *R & Eng* Apr -92; with natural and forced draft, Spence *The Eng* Feb 17-88

- Boilers**, tests, BABCOCK and Heine, comparative, Emery, report  
*St RJ* Apr **-92**
- BABCOCK & Wilcox, Longridge, report *Eng* \* July 11 \* Dec  
**19-90**
- BLAST furnace waste gas as fuel, effic., Jacobus *Am ME* v 17  
**-89**
- COIL boilers, Gov't. *E News* Oct 13-**88**; Ward's coil, U. S.  
 Navy \* Aug 29-**91**
- DONNELLY's pat. grate, Schneider, abs. *Inst CE* v 92 **-88**,  
*Zeit Dampf* **-87**
- DOWNDRAFT draft, Complete Combustion Co.'s tubular, Gal-  
 loupe *E News* Mar 23 \* Sep 7-**89**, Galloupe *F Inst* Feb,  
 Lozano, cor. May **-88**
- LANCASHIRE, evap. of, Longridge *Eng* Apr 11, 18-**90**, do.  
*The Eng* \* Feb 14-**90**, Nov 6-**91**; three-flued, Crosland,  
 Mar 11-**92**
- oval, two-flues, evap., abs. *Inst CE* v 91 **-88**, *Zeit Verb*  
*Dampf* **-87**
- PORTABLE, W. Webber *Am ME* \* v 13 **-92**
- RED-hot furnace crown expts., McKean *Cassier's* Jan **-92**;  
 do. explosions *Eng* Jan 30 \* Feb 13 \* Mar 6, 13 - Apr 17-**91**,  
 do. *Pwr* \* Nov **-90**
- STEEL, open-hearth, use and testing for, Goodall, discuss. (full)  
*Inst CE* \* v 92 **-88**
- WARD's sectional *Eng* \* Apr 5-**89**
- WATER-tube, Knap *The Eng* May 25-**88**
- TUBES, leaky *Pwr* \* Sep **-92**; Serve's ribbed *Eng* \* Mar 22-**89**,  
 Oct 24, 31-**90**, *E News* \* Nov 8-**90**, \* May 9-**91**, *R & Eng*  
 \* Aug, *R Gaz* May **-91**, *The Eng* \* Apr 19-**89** \* Oct 31-**90**
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 \* Dec 19-**90**, Dec 23-**92**; Thornycroft, abs. *Inst CE*, *R &*  
*Eng* Feb **-90**; Almay's, corrug. mul. steam gen. *Pwr* \* Oct,  
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**-92**; Sibley coll., Thurston *Sc Am Sup* \* Apr 14-**88**; Yar-  
 row's *The Eng* \* Jan 16; Mill's \* Dec 4-**91**. See also MA-  
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- Bolden**, Henry *Inst CE* v 109 **-92**
- Bolivia**, mineral resources, Minchin *Eng* \* July 11-**90**, Apr 17-**91**
- Bolton**, Francis J. *Inst CE* v 93 **-88**
- Bolts**, drift, holding power, expts. *E News* Feb 28-**91**, *E Rev*  
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- Book** binding machinery, Paris exhib. *The Eng* \* May 3-**89**
- Book-keeping**, Child *E Mag* Aug -**91**
- Books**, in library *F Inst* Sep -**88**. See also BIBLIOGRAPHY; ENG. literature; INDEXES, etc.
- Booth**, J. C. *F Inst* July -**88**
- Boothby**, Alexander C. *Inst C E* v 97 -**89**
- Boots** and shoes, manuf. of, Rich *Pop Sci* \* Aug -**92**
- Borax**, history in U. S. *E & Min* Sep 10-**92**; manuf., Witting, Dec 22-**88**, *J Soc Chem Ind*; California, Hake (full) *Sc Am Sup* \* Jan 18-**90**; sources and applics., Fleming, July 4-**91**. See also under CHEMISTRY
- Boring** machine, for angular holes *E News* \* Mar 21-**91**; hand power diamond (for ore deposits), Nordenström, abs. *Inst C E* v 99 -**90**, *Jern Kontorets An* -**88**, *Oest Zeit Berg* v 37. See also DRILLS; MINING; QUARRYING
- Boston** Heating Co's plant, Abbott, insets *Am Min* \* v 16 -**88**, *Eng* \* Aug 30, \* Sep 6-**89**
- Boston**, Mass., U. S. *Eng* \* June 15, 15, 22, 29-**88**; harbor improvements *E News* Sep 22-**88**; houses, tenement, Mar 2-**89** MUNIC. eng., City eng'r's rep. '89 *E Rec* Apr 5-**90**; parkways, road and drainage construction *E News* \* Sep 15-**88**; passenger traffic *R Gaz* June 17-**92**
- RAPID Transit Commission rep. to Mass. Legislature, Apr 5-**92**, abs. *St R J* May -**92**; proposed sys. *E News* Mar 14, European practice, Howes, Dec 5-**91**
- STREET pavements *E News* May 12, st. sprinkling, June 2-**92**; st. dept. report *E Rec* Apr 23-**92**
- Bottle** manufacturing by machinery, glass, Ashley *Eng* \* Oct 11-**89**; do. German, Partello *Sc Am Sup* June 30-**88**
- Boulanger**, General, por. *Sc Am Sup* \* July 7-**88**
- Bourdeaux**, John *Inst C E* v 104 -**91**
- Bower**, John *Inst C E* v 92 -**88**
- Box** nailing machine, Hodge's *Eng* \* Mar 29, 29-**89**, *The Eng* \* Mar 22-**89**
- Brain**, cerebral radiation, Houston *El Rev* June 4, *F Inst* June; discovs. in anatomy and physiology of, Putnam *Tech Q* Apr -**92**
- Brakes**, Carter *El Rev Lond* \* July 8-**92**; Prony brake, horse power characteristics, Crane *El Wld* \* Mar 15, 22-**90**, do. *Pwr* Feb, June \* Nov \* Dec -**88**. See also ENGINES, brakes; RAJLROADS, brakes

- Bramwell**, George W. W. *Inst C E* v 109 -**92**
- Branner**, John C., por. *E & Min* \* Dec 12 -**91**
- Brass** foundry building, Nat. Meter Co., Brooklyn *E Rec* \* June 18 \* Sep 10 -**92**; (locom. construction) *The Eng* Oct 21 \* Nov 4 \* Dec 30 -**92**
- Brazil**, Ivins *Sc Am Sup* Jan 4 -**90**
- Brewery**, Guinness' *Eng* \* Sep 14, 28, tramways, Georghegan \* Oct 12 -**88**, do. St. James Gate *The Eng* Aug 24, tramways in, 31, 31 -**88**, do. Dublin *Sc Am Sup* Dec 1 -**88**
- Brewing**, Paris exhib. *Sc Am Sup* \* May 10 -**90**, *Genie Civil*; Trades exhib. *The Eng* Nov 2 -**88**
- Bribner**, Alan *Inst C E* v 101 -**90**
- Brick**, law of crushing strength, Baker *E News* Feb 2 -**89**; brick-work, to estimate, n Oct 12 -**89**; permeability, expts., Hale \* Jan 3, 10; nomenclature, com. report Mar 7 -**91**. See also PAVEMENTS, brick
- MAKING industry, manufacture about N. Y. city, Tomkins; near Chic., Purington; slate, Villalon; in Sinaloa, Mex., Avela, *Am C E* v 18 -**88**; and pavement, discuss., Calkins, insets (full) \* v 26 -**92**; Davis, bk. review *E & Min* Dec 21 -**89**; oil vs. coal for burning, Crafts *E News* Feb 2 -**89**; Hudson river *Sc Am Sup* Nov 8 -**90**; machinery, Bale \* Feb 8 -**90**, *Bld News*; do. Craven, stiff plastic *The Eng* \* July 25 -**90**
- Brickenden**, James G. *Inst C E* v 92 -**88**
- Bridges**, *Eng* spec., Am., Pencoyd Iron Works, Dec 7, 21 -**88**
- E News* the world's great, and North river, proposed \* Jan 14; wts. of, formulas, Mosscrop, Mar 17 -**88**; live loads and wts. of, Pegram, ed. \* Jan 10, 10; and trusses, skew pin connections, imp. in, Steiner \* Oct 17 \* Dec 26 -**91**; soft steel in, Lewis, Nov 7 -**91**, Jan 16, Mar 26 -**92**
- E Rec* soft steel in, Lewis, Mar 12-26, Apr 2 -**92**, do. Bischoff, Krohn, abs. *Inst C E* v 107 -**92**, *Zeit ost Ing* -**91**
- R Gaz* development of iron, Whipple \* Apr 19; eye-bars, wrt. iron and steel, tests, Gaylor \* May 10 -**89**, *J Assoc Eng Soc*; long plate girder (115-ft.), econ., G. Thomson \* May 23 -**90**; details, Swensson, Feb 26; disputed points in designing, Waddell, cor. Sep 9, 23 -**92**
- The Eng* staging for erection, June 8 -**88**; highest viaducts in world (list), June 10 -**92**. See also BRIDGES, draw-bridges, highway, railroad

- Bridges**, AARE, Coblenz, pneu. foundations *E News* \* Apr 9-**92**  
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- ALBANY, N. Y., Hawk st. viaduct *E News* \* Feb 16-**89**
- ALOGOAS Ry., Brazil *E News* \* July 25-**91**
- AMERICAN, and English, Fidler *Eng* Nov 9, Dec 7, 21, 28-**88**, new, ed. Oct 3-**90**; table, Berkley *Inst CE* v 107-**92**; French engineer on, Le Rond *R & Eng* Sep -**89**, *An Ponts*
- AQUEDUCT truss *E Rec* \* Mar 14-**91**
- ARAUCO R and Bio-Bio, Manby *Inst CE* \* v 108-**92**
- ARCHED, *Eng* pressures on voussoirs and abutments, Paterson, cor. \* Dec 14, joints, pressures, Trautwine \* 21-**88**  
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- E Rec* St. Paul, Col. st. skew arch \* Nov 23-**89**; Minneap. steel \* May 10-**90**; stone park, Prov. \* July 23-**92**; skew arch course traces, Haines *Inst CE* v 105-**91**; German construction with hinged arches, Riviere, abs. v 107-**92**; *An Ponts* June **91**; Monocacy Creek stone, sidewalk, Beth., Pa., Grossart *Lehigh Eng* J Apr -**89**; Wheeling, W. Va., 158-ft. *R Gaz* \* Aug 15-**90**. See also ARCHES
- ARTHUR Kill draw-bridge, Staten Is. Rap. Tran. Co. *R Gaz* \* June 22-**88**, \* July 26-**89**
- ASSAM suspen., Doyong river *The Eng* \* Aug 15-**90**
- AUSTRIA iron, renewal, Huss, abs. *Inst CE* v 98-**89**, \* *Zeit ost Ing*-**89**

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 BATTERSEA, England, inset *The Eng* \* July 25-**90**  
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     *E & Min* problem, Apr 28-**88**, (terminals) inc. of carrying capac., Wellington \* Apr 5-**90**, problem \* Jan 17-**91**  
     *E News* growth of traffic \* Feb 11, enlarging capac., report of bd. of experts and eds., with inset map of residence areas \* Mar 17, 24, terminals, report Apr 21, adopted plans for, C. Martin, Wellington and eds. \* 28, do. discuss. *Brooklyn Eagle* 28-**88**, terminal plans *E News* \* Jan 11, Mason, cor. \* Mar 8, problem May 3-**90**, new terminals, report \* Jan 17, enlarging capac., ed., diag. and second report \* Feb 14, 14, 28, cor. \* Mar 7, cor. \* 21-**91**  
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     *R Gaz* terminals, proposed \* Dec 27-**89**, report, Dec 11-**91**, traffic, Cable Co., table, Oct 28-**92**

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*St R J* bd. of experts report \* Feb -91, report, Jan -92.

See also CABLE railroads, Brooklyn bridge

**BUFFALO** Trace, viaduct Ky. Midland R. *E News* May 25-89, erection *E Rec* \* Dec 14-89

**BUENOS AIRES** & Valparaiso Transandine, Jackson, inset *Inst C E* \* v 109 -92

**BUILDING**, combination on Pac. coast, Ottewell, insets *Am CE* \* Oct 27-92; construction, iron and steel, Fidler, bk., Griffin & Co., Lond. -87; history, Manners *Eng* \* Jan 1-28 \* Feb 5-26 \* Mar 4, 11-92, do. *E Rec* Jan 30, Feb 13-27, Mar 5, 26, Apr -92, do. *Sc Am Sup* \* Mar 12, 19 \* Apr 16, 23 \* May 7, 14, 28, Aug 6-92; in Am., T. Thomson, insets *E Mag* \* Oct -92; rivets, conventional code for, Ferris, cor. *E News* \* Jan 26-89; England and U. S., prices, Dec 15-92; erection, European methods *E Rec* \* Mar 1-90; development, Trowbridge *Sc Am Sup* Mar 17-88, *N Y Acad Sci*, do. Swain *Soc Arts Mass* -88

**BULL Creek**, Paola, Kan., Kan. C. Fort Scott & Memphis R. *E Rec* \* Mar 5-92

**BUSSEY**, Robbins *Tech Q* \* Sep -87

**CAIRO**, Ohio river, Ill. Cen. R., substructure, inset *E News* \* Feb 7-91, *R & Eng* Dec -89, *R Gaz* June 1-88

**CAPUTH** ferry, Tay river *Eng* \* Sep 13-89

**CASCADE**, Sears, cor. *E News* Sep 1, Oct 6-88

**CEREDO**, Ohio river *E News* \* May 17-90

**CERNAVODA**, Danube river, Roumania, proposed *E News* \* Aug 23-90

**CERVEYRETTE** gorge, Briancon, France, inset *E News* \* June 9-92, *Sc Am Sup* \* May 21-92

**CHATTANOOGA**, Tenn., Walnut st., inset *E News* \* May 16-91

**CHENAB**, Indian State R. *The Eng* Sep 14-88

**CHESAPEAKE & OHIO**, Ohio river, Burr, inset *Eng* \* Dec 5-90

**CHICAGO**, Ogden Ave. viaduct, inset *E News* \* Feb 6-92; draw-br., Madison st., inset *R Gaz* \* Mar 11-92

**CHICAGO**, Bur. & Northern *E News* \* Apr 7 \* May 5, June 9-88

**CHICAGO**, Bur. & Q. R. standard double track *E Rec* \* Oct 6-88, \* Jan 26 \* Feb 9-89

**CHICAGO**, Mil. & St. P. R. pin bearing plate girder *E Rec* \* Nov 21-91

- Bridges, Chicago & No. Western R.** thin floor plate girder *E News* \* Apr 9-**92**
- CHICAGO & WESTERN INDIANA BELT R.**, 105-ft. double track through span *R Gaz* \* Oct 30-**91**
- CHITTRAVATI river**, Madras R., India, Stoney *E Rec* \* Apr 30 \* Aug 6, 13 \* Nov 12-**92**, and discuss., insets *Inst C E* \* v 103, 104-**91**
- CINCINNATI & COVINGTON** elevated R. Transfer & Br. Co., river spans of, Burr, insets (full) *Am C E* \* v 23 -**90**, (full) *Sc Am Sup* \* Dec 13-**90**
- CINCINNATI & NEWPORT** *E Rec* Sep 10, Nov 5 \* 19 \* Dec 31 etc. -**92**
- CLARENCE**, Taff river, Cardiff, So. Wales, inset *Eng* \* Jan 30 \* Feb 13, inset \* Mar 6, inset \* 20, 20-**91**
- CLEVELAND** central viaduct *E News* \* Dec 22-**88**
- CLYDE river**, proposed *R & Eng* \* Mar -**89**, \* *Industries*
- COFFER-dam or caisson** without timber or iron in its construction, R. Harris, discuss., insets *Am C E* \* v 24 -**91**, *R & Eng* May -**91**
- COLORADO** river cantilever, Cal. & Ariz. R. *E News* \* Feb 23 -**89**
- COLUMBIAN** exhib. steel canal *E News* \* Apr 21-**92**
- COLUMNS**, z-iron, expts., Strobel *Am C E*, *R Gaz* July 13-**88**
- COMPRESSION members**, Bess. steel, expts., Dagron, discuss., insets *Am C E* \* v 20 -**89**
- CONEMAUGH** arch, Penn. Cen. R. *E News* \* Mar 29-**90**
- COTEAU**, St. Lawrence river, Quebec, Can. Atlan. R. *E News* \* Apr 12-**90**, machinery for swing span, inset \* May 30, 30 -**91**, construction, Mountain, abs. *Inst C E* v 109 -**92**, *Can Eng* -**91**. See also BRIDGES, draw-bridges
- CRIB**, Salisbury & Haney R., N. B. *E News* \* June 7-**90**
- CRUEIZE** viaduct, Marjevois, So. France R., n *R & Eng* \* Mar -**91**, \* *Genie Civil, The Eng* \* June 5-**91**
- CUMBERLAND**, Md., Balt. st. *E News* \* July 21-**92**
- DALMARNOCK**, Glasgow, inset *Eng* \* Mar 28-**90**
- DELAWARE**, Lack. & W., White's plate girder *R & Eng* \* July -**91**
- DRAW-BRIDGES**, swing, turning by elec. power *El Rev* \* Apr 20-**89**; hydr. machinery, Fidler *Eng* Feb 19-**92**; end-adjusting gear for, Turner *E News* \* Apr 16, vertical lift, method of operating \* June 20-**92**; lock, Penn. R. *R Gaz* \*

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- July 27-**88**; protection, Boston, Rev. B. & L. R., Hammond, Oct 14-**92**
- ARTHUR Kill, Staten Is. Rap. Tran. Co. *R Gaz* \* June 22-**88**, approaches \* July 26-**89**
- BERLIN, Moltke iron tilt, Pinkenburg, abs. *Inst C E* v 92-**88**
- BRIDGEPORT, Ct., elec. operation *El Wld* \* Apr 20-**89**
- CASTLETOWN swing, Wawn, inset *Inst C E* \* v 92-**88**
- CHICAGO river folding, *Eng* \* July 24-**91**; swing by electricity *R Gaz* \* Aug 21-**91**; Madison st., inset \* Mar 11-**92**; Weed st., folding floor *E News* \* May 23-**91**
- COTEAU, St. Lawrence river, Quebec, Can. Atlan. R., machinery for swing span, inset *E News* \* May 30, 30-**91**. See also BRIDGES, Coteau
- DEE river swing, Manchester, Shef. & Lincoln R. *The Eng* \* Nov 22, 29-**89**
- DISMAL swamp canal, Norfolk & W. R., inset *E News* \* Nov 3-**92**
- DRYPOOL swing, Hull *The Eng* \* Jan 3-**90**
- DULUTH, Minn., ship canal, designs *E News* \* Oct 27-**92**; lift, proposed, inset *R Gaz* \* Apr 8-**92**
- FLORENCE R., Tenn. river *E Rec* \* Feb 28-**91**
- FRASER river Howe truss, Can. Pac. R., Cambie *R Gaz* \* Nov 25-**92**
- GLAMORGANSHIRE canal swing, Cardiff *The Eng* \* Aug 7-**91**
- HACKENSACK, Erie R. *R Gaz* \* July 20-**88**
- HARLEM river lift, *R Gaz* June 10, temporary pile supports, Triest \* Aug 19-**92**
- KIDDERPORE docks swing *The Eng* \* Apr 22-**92**
- MANCHESTER ship canal swing *Eng* June 6-**90**
- NANTICOKE river R., erection *E Rec* \* May 16, 23-**91**
- NEW London, Ct., Thames river *E News* \* Aug 16-**90**
- OAKLAND, Cal., accident *E News* \* June 7-**90**
- PAUMUNKEY river, erection *E Rec* \* Feb 14-**91**
- PETALUMA *E News* \* Oct 13-**88**
- POLLET swing, Dieppe, France *R Gaz* \* Aug 26 \* Sep 9-**92**, inset (full) *The Eng* \* July 29 \* Aug 5-19 \* Sep 9-**92**
- TARENTO, Italy *E News* \* Sep 13-**90**
- THAMES river, New London, Ct., pivot pier *R Gaz* \* Nov 7-**90**
- TIENTSIN, China R. *The Eng* Feb 3, 24-**88**
- WINONA, Minn., swing span, inset *E News* \* Oct 17-**91**

- Bridges, DUFFERIN**, Ganges river, Benares, Oude & Roh. R., India *Eng* \* Feb 17, 17-**88**, Walton, Mar 7-**90**; construction, Walton *E Rec* Aug 22 \* Dec 19-**91**, Jan 9, 30-**92**; Walton, discuss., insets *Inst C E* \* v 101 -**90**, do. *The Eng* Mar 14-**90**
- DULUTH**, Minn., 6th ave. viaduct *E Rec* \* Feb 20, 27, harbor entrance, proposed May 14-**92**. See also BRIDGES, draw-bridges, Duluth
- DU VIAUR** viaduct, proposed, inset *E News* \* Nov 30, 30-**89**
- EARN** viaduct, Caled. R., Scot., renewal, inset *Eng* \* Sep 16-**92**
- ENGLISH Channel**, proposed, Schneider *Eng* Sep 27-**89**, ed., Aug 7-**91**, \* Sep 23-**92**; Talansier *E Rec* \* Nov 2, 16-**89**, \* *Genie Civil*; *F Inst* Nov -**89**; *R & Eng* \* Nov -**89**; *R Gaz* Oct 11-**89**; Fleury *Rev des Deux Mondes* Aug 15-**92**; Schneider, Hersent, prelim. designs (very full) *Sc Am Sup* \* Nov 2, 9, 16 \* Dec 21, 28-**89** \* Jan 25-**90**, do. *The Eng* \* Sep 27 \* Oct 4, 11-**89**
- ENZ river**, Hofen *Eng* \* May 6-**92**
- FLOATING**, Portsmouth & Gosport, Harris *Eng* \* Oct 7 *E Rec* Oct 15, *Sc Am Sup* \* Nov 19, *The Eng* \* Sep 23-**92**, *Inst ME*
- FLOORS**, wrt. iron double track floor-beam, Boller, discuss., insets *Am C E* \* v 18 -**88**; do. *Sc Am Sup* \* June 2-**88**; do. *The Eng* Apr 27-**88**; floor-beams and pine stringers for, Bates, dis., insets *Am C E* \* v 23 -**90**; Hobson's flooring *Eng* \* Nov 29-**89**; iron and ballast floor *E News* \* Mar 23-**89** \* Oct 27-**92**; solid R. *R Gaz* June 27, ed. Oct 31-**90**, shallow \* Sep 11 -**91**. See also BRIDGES, railroad, floors
- FOOT-bridges**, Oker river, Brunswick, inset *Eng* \* Aug 17, inset \* Sep 7-**88**; Ouse river, Bedford *Sc Am Sup* \* Sep 8-**88**; Kernot, cor. *The Eng* Aug 16 \* Nov 15-**89**
- FORTH**, *Am C E* obs. on, Emery, insets \* v 22 -**90**
- Eng* inset, \* Apr 27, May 11, inset, 25, July 6, Aug 10, Cooper 31, Biggart, Dec 14-**88**, compared with Eiffel tower, May 3, inset. Nov 15. inset, 29, Dec 6-**89**, history, Westhofen (very full des.), insets \* Feb 28, ed. Mar 7, assessable valuation. Oct 3-**90**
- E Mag* greatest in world, Clarke \* Apr -**91**
- E & Min* \* Mar 15-**90**, \* *Industries*
- E News* \* Mar 10, Cooper \* Sept 22-**88**, \* Feb 9, determination of wind pressure by model, n Mar 16-**89**, inset \* Jan 25, 25, testing, Feb 15, notes. Mar 15, final inspection report. Mar 29-**90**, criticisms, Cooper, cor. Lindenthal, Dec 5-**91**

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*E Rec* Baker \* Oct 12-**89**; construction \* Sep 6-**90** \* Jan 10-**91**

*Inst C E* hydr. appliances at works, Moir, inset \* v 91 -**88**, Austrian prototype of Köstlin, abs. n v 92; Queen's ferry. Nott Locom June -**90**

*R & Eng* description \* Feb -**90**

*R Gaz* Biggart \* May 18, erection \* July 13, discuss. on bridge steel, Cooper, Sept 14-**88**, *Iron & Steel Inst Brit.* \* Nov 15-**89**, *Industries* Oct 11-**89**, wind pressure obs. *R Gaz* Apr 18-**90**

*Sc Am Sup* Cooper \* Oct 13 \* Nov 17-**88**, Jan 19-**89**

*The Eng* Feb 3, Aug 24. Oct 19, 19, Nov 9, 9-**88**, \* Jan 11, July 26 \* Aug 2, 23, 23, inset \* Dec 13-**89**, \* Feb 28, opening, Mar 7, Ry 14-**90**

FORT Madison, Miss. river, inset *Eng* \* July 19-**89**, *Sc Am Sup* \* Aug 31-**89**

FORT Smith R., Ark., piers *E Rec* \* Oct 22-**92**

FOUNDATIONS, design, H. Lewis *E News* Oct 17-**91**; repairing, Wash. aqueduct, D. Hunt *E Rec* \* Dec 27-**90**; piling vs. mud-sills, Cantine *R Gaz* Sep 9-**92**. See also FOUNDATIONS

GAGNIERES viaduct *R & Eng* \* May -**89**

GARABIT viaduct *E Rec* \* Mar 7-**91**; Eiffel, abs. *Inst C E* v 95 -**89**, *Comptr* July -**88**

GIRDER, fundamental types of metallic and the cantilever system, Gaudard, abs. *Inst C E* v 106-**91**, *An Ponts* Mar -**91**; girder tests, Austrian, mild steel *R Gaz* \* Nov 27-**91**; girder flanges, lateral stability of *The Eng* \* May 29-**91**. See also BEAMS and girders

GLAMORGANSHIRE canal swing, Cardiff *The Eng* \* Aug 7-**91**

GLASGOW harbor high level, proposed *Eng* Jan 11-**89**; Glasgow Cen. R., inset \* Aug 19-**92**. See also BRIDGES, highway, Glasgow; Railroads, underground, Glasgow Cen.

GLENURY viaduct timber arch *E Rec* \* Nov 12-**92**, *Eng*

GREENOCK & Gourock R., inset *Eng* \* Feb 22-**89**

GROUSE valley R. *E Rec* \* Jan 19-**89**

GOURL Noir viaduct, Vegere river, Uzerche, France, inset (full) *E News* \* Aug 18-**92**

HACKENSACK draw-bridge, Erie R. *R Gaz* \* July 20-**88**

HARLEM river, N. Y. *E News* \* May 26-**92**; *E Rec* \* Jan 21, erection \* July 7-28 \* Aug 11, Sep 1-**88**; lift *R Gaz* June 10,

**Bridges, HARLEM**

temporary draw-br. pile supports, Triest \* Aug 19-**92**. See also BRIDGES, draw-bridges, Manhattan

HAWARDEN, Dee river, Fox *E News* \* Sep 15-**92**, inset *Inst CE* \* v 108 -**92**

HAWKESBURY R., New So. Wales, Burge *Eng* Mar 7-**90**; motions, observed in, Ewald, cor. \* Feb 6-**91**, do. *E News* \* Mar 14-**91**; Jan 5, testing, July 20-**89**; erection *E Rec* \* May 30 \* June 6-**91**; Burge, insets *Inst CE* \* v 101 -**90**; placing the center span *R Gaz* \* Aug 10-**88**; *Sc Am Sup* \* Aug 11-**88**; *The Eng* Sep 7-**88**, June 14, Sep 13-**89**, Burge Mar 7-**90**

HIGHWAY, Cincin. cantilever, Kaufman, insets (very full) *Am CE* \* v 27 -**92**; Glasgow road, Grt. West. R., inset *Eng* \* Aug 22-**90**

*E News* Waterford, N. Y. \* June 1; iron viaducts for, Waddell, 8; \* July 6-**89**; supervision, proposed system, Stowell, Mar 22, 29; legislation, proposed, Breithaupt, cor. Apr 19; designs, Owen, cor. May 10; the bridge of the future, Dibbles \* June 21; Guilderland, N. Y. (unsafe), Stowell, cor. \* Aug 30; wire suspen., Victor, Cal., etc. \* Nov 8-**90**; plate girder, Brookline, Mass., inset \* Sep 19-**91**; Rockford, Ill., State st. plate girder, inset \* Feb 27; Stearns truss for \* July 21-**92**

*E Rec* viaducts across R. tracks, Gayler, Sep 19-**91**, do. *J Assoc Eng Soc*, iron and steel, Waddell, discuss. Nov -**88**, abs. *Inst CE* v 95 -**89**; floors of st., Gayler, abs. v 93-**88**, *J Assoc Eng Soc* -**88**; Kelvin river road, Glasgow *R & Eng* \* Nov -**91**; Niemen river, Olita, Russia \* Dec -**92**; 158th st., over N. Y. Cen. R. *R Gaz* \* Nov 9-**88**; Nova Scotia \* May 3-**89**; over R. tracks, experience with, Gayler. Aug 21 -**91**; brick, Persia *Sc Am Sup* \* Dec 31-**92**

HOOGHLEY river Jubilee R., India, Leslie *Eng* Jan 27-**88**, erection *E Rec* \* Oct 4, 25-**90**, do. discuss., inset (full) *Inst CE* \* v 92-**88**, do. *The Eng* Feb 10-**88**

HOWE truss, timber, Willamette river, Albany, Or. *Eng* \* Jan 6-**88**; timber structures, western Am. 180 and 250-ft. span, inset \* Oct 7-**92**; determination of length of strut. D'Armit, cor. *E News* \* Nov 16, 23, strut prob. Dec 14-**89**; Or. Pac. R., strain sheets, inset \* Apr 26, 26; 50 and 68-ft. spans, Can. Pac. R. \* May 24-**90**; R., Jameson *R & Eng* \* Mar \* May \* June \* Aug \* Sep \* Oct \* Dec -**90** \* Jan \* Feb -**91**; Willamette

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river, timber, Albany, Or. *R Gaz* \* Apr 19-**89**, *Sc Am Sup*  
\* Mar 17-**88**, *Eng*

HUDSON river, first design, Pope's flying lever, 1811 *R & Eng*  
\* May -**88**; tunnel, ed. *E News* May 31-**90**

INDIA, bridging alluvial Punjab rivers, ed. *Eng* Jan 31, notes,  
Feb 14, Mar 28-**90**; Chitravati, discuss., insets (full) *Inst C E*  
\* v 103, 104-**91**. See also BRIDGES, Chitravati—Hooghley  
river — Sukkur

IRON, wts. of, formulas, Beatty *Lehigh Eng J* June -**88**

JERSEY City, Harsumm's Cove transfer, Benset, insets *Am C E* \*  
v 19 -**88**

KANAWHA river *E Rec* \* Aug 17, 31 \* Sep 14, 28 \* Oct 5, 19, 26  
-**89**

KENNEWICK, No. Pac. R. *R Gaz* \* Nov 8-**89**

KENTUCKY river, or Tyrone cantilever, inset *E News* \* Apr 5-  
**90**; Irvine, Ky., erecting \* May 26-**92**

KENTUCKY & Indiana, Louisville *Eng* \* Jan 27-**88**; Moulton,  
abs. *Inst C E* v 92 -**88**, *Am C E* Sep -**87**

KINGPOST truss, wrt. iron shoe for, Cin. N. Or. & Tex. R. *E News*  
\* Apr 6-**89**

KINZUA viaduct, J. Clarke *Am M E* \* v 11-**90**; 1882, T. Clarke  
*E News* July 5, n, Aug 30-**90**

LAGAN, Belfast *The Eng* \* Aug 22, 29, 29-**90**

LANSDOWNE, at Sukkur, Indus river. See BRIDGES, Sukkur

LOA viaduct, Antofagasta R., Bolivia 336 ft., highest in world  
*E News* \* May 18-**89**, *R & Eng* \* June -**89**, *Sc Am Sup* \*  
Mar 15-**90**, *The Eng* \* Apr 19, 19, inset \* 26-**89**

LONDON, England, Blackfriars, Thames river, Lond. Chat. &  
Dover R., Cruttwell, discuss., inset *Inst C E* \* v 101 -**90**, *The Eng* Mar 21-**90**

THAMES river, proposed *E Rec* \* Nov 19-**92**, do. Ratcliffe to  
Rotherhithe, and ed. *The Eng* \* Oct 28, 28-**92**

TOWER. See BRIDGES. Tower, London

LONG span, discussion of, Lindenthal *E News* \* Mar 3, 10, 24;  
very long span, proposed design, Warren \* June 30-**88**; and  
North river, N. Y., Lindenthal, Nov 9, 16, 23-**89**; table *R Gaz*  
May 2-**90**

LYONS, Rhone river, Nansouty, abs. *Inst C E* v 106 -**91**, \* *Genie Civil* v 19 -**91**; great, Fournere & Croix, Rousse *Sc Am Sup*  
\* Oct 24-**91**

- Bridges**, MALLECO viaduct, Chili, Mamy. abs., inset *Inst C E* \* v 104-**91** *Genie Civil* \* v 18-**91**
- MANARVATER timber viaduct, New Zealand *E Rec* \* Jan 4-**90**
- MANHATTAN, Harlem river, N. Y. *Eng* \* May 4-**88**, *E News* \* Feb 4, Sep 8-**88**. See also BRIDGES, Wash.
- MARBLE Creek viaduct *E Rec* \* Apr 18-**91**
- MARENT Gulch high viaduct, No. Pac. R. *R Gaz* \* Apr 26-**89**
- MARGHERITA, Rome *R & Eng* \* June -**92**, *Industries*; Turin, Po river, abs. *Inst C E* v 92 -**88**, *Giornale Civ* -**87**
- MASONRY, with semi-free joints, Cunningham *Eng* \* May 6. *Sc Am Sup* \* June 25-**92**, *An Ponts*
- MATTABESSETT river, E. Berlin, Ct., inset *E News* \* Apr 2-**92**
- MAUCH Chunk suspension, Hildebrand *E News* \* Feb 25, Mar 10-**88**
- MEMPHIS R., Miss. river, Tenn. *E News* \* May 12, inset \* June 16, inset \* Sep 15-**92**; erection *E Rec* June 20 \* July 25 \* Oct 17-31 \* Nov 7-**91** \* May 14-**92**; and ed. *R Gaz* \* Feb 21 -**90**, June 26-**91** \* May 13-**92**; *The Eng* Aug 3-**88**
- MICHIGAN Cen. standard, with 3 inside guard rails *R Gaz* \* Nov 1-**89**
- MISSOURI Pacific, inset *E News* Feb 14-**91**
- MOLDAU viaduct, at Cervena *E News* \* Apr 19-**90**; Huss, abs., *Inst C E* v 98 -**89** \* *Woch ost Ing* -**89**
- MONTRÉAL, proposed *E News* May 31-**90**
- MORAND, Rhone river, Lyons *The Eng* \* Oct 16, 23, 30-**91**
- NEEDLES, cantilever, Col. river, Cal., Atlan. & Pac. R., inset *R Gaz* \* Apr 25-**90**
- NEWARK Dyke, Grt. Northern R. *The Eng* \* Mar 7, 21-**90**
- NEW Brunswick, N.J., Albany st. masonry arch *E News* \* Apr 16-**92**
- NEW London, Ct., Thames river. See BRIDGES, Thames river
- NEW Orleans, Miss. river, projects *R Gaz* \* May 16 \* July 11-**90**
- NEWPORT viaduct, Isle of Wight, inset *Eng* \* Jan 25-**89**
- NEW York Cen. double track with solid plate floor *R Gaz* \* May 17-**89**
- NEW York and N. J., Clark report, inset *R Gaz* \* Sep 23 *Sc Am Sup* Oct 22-**92**. See also BRIDGES, Harlem, Manhattan-North river, railroad, Washington, etc.
- NEW York, Prov. & Boston ballast floors *E News* \* Mar 1-**90**
- NEW York Rapid Transit R. viaduct, proposed *E News* \* Oct 31-**91**

- Bridges**, New York Terminal R., Hudson river, proposed *E Rec* \* Jan 14-**88**
- NIAGARA suspen., towers reconstruction, Buck, *Am C E* v 17-**87**, abs. *Inst C E* v 93-**88**
- NORFOLK & Carolina transfer, inset *E News* \* Jan 30-**92**
- NORFOLK & Western standard plans *E News* \* June 23, 28-**88**
- NORTH river suspen., N. Y., proposed, Macqueen *Cosmop* Aug -**92**; Lindenthal *Eng* \* May 9-**90**; and world's great *E News* \* Jan 14, 14, discuss. of long span bridges, Lindenthal \* 28, 28, Feb 4-**88**; July 20-**89**; Lind. reply *E Rec* July 20-**89**; *Sc Am Sup* \* Nov 7-**91**, *R Rev*; Lindenthal's project, criticism, Ende *The Eng* \* May 17, Lind. Aug 30-**89**
- OAKLEY skew, Cin. & Rich. R., design and erection Crowell, insets *Am C E* \* v 23-**90**
- OHIO, Cin. & Covington Elevated R., Burr, *Am C E* v 23-**90**, abs. *Inst C E* v 103-**91**
- OHIO Connecting R., Pitts. Pa., floating 523-ft spans into place, inset *E News* \* Sep 20, false works \* 27-**90**, do. (full) *E Rec* \* Sep 13, erection \* Dec 13-27-**90** \* Jan 3-**91**, Strobel, abs. *Inst C E* v 103-**91**; inset *R Gaz* \* June 20, Aug 22, inset \* Sep 12-**90**
- OHIO river, completion of, *E News* Jan 12-**89**
- OMAHA, erection *E Rec* \* Mar 9, 16-**89**; suit *R Gaz* July 31-**91**
- ORISKANY, N.Y., Cen. & Hud. R. R., inset *E News* \* Dec 7-**89**
- OSCHUTZ viaduct *R & Eng* \* May -**88**
- PADERNO viaduct, Adda river, Sacheri, abs. *Inst C E* v 98-**89** \* *L'Ingeg Civile* -**89**, *R Gaz* \* Sep 14-**88**
- PALATINE, Tiber river, Rome *R & Eng* \* Mar -**92**
- PARALLEL-chord, tables for finding stresses in, Hitchcock, inset *E News* May 23-**91**
- PASSENGER ferry, N.Y. L. Erie & W. R. *E News* \* Apr 6, cor. 20-**89**
- PATIALA-Bhatinda R., iron-work *The Eng* Nov 16-**88**
- PECOS river, Southern Pac. R.. Tex. *E News* \* Feb 6-**92**
- PENCOYD shop *E Rec* \* July 27 \* Aug 3-**89**
- PENN. R. frt. car transfer, Jersey City, inset *E News* \* Jan 18, 18-**90**; draw-bridge lock *R Gaz* \* July 27-**88**
- PHILADELPHIA, Market st. cantilever, Amweg *E News* Apr 7-**88**
- PIERS, Red river concrete, Purdon *E News* \* June 2-**88**; French masonry and detail \* Sep 5-**91**; Stettin, Ger., masonry removal \* July 14; screw piles for \* Aug 4-**92**; moments, graph.

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method of obtaining, Lindenberger *F Inst* \* Nov -**89**; and river crossings, Otagawa *R & Eng* \* Nov \* Dec -**88**, Jan -**89**; repairing under water, Rossignol \* Sep -**90**, *An Ponts Pile* and trestle, Robinson *E News* Apr 7-**88**. See also BRIDGES, railroad; PILING; TRESTLES

PINS, fibre strain in, J. Johnson *E News* \* Jan 28, Du Bois, cor. Mar 10, strains in, Fowler, cor. \* 24; and eye-bars, proportions, Stowell, Mar 31-**88**

Po river, at Casalmaggiore, Parma-Brescia R., erection *E Rec* \* May 5-26-**88**, abs. *Inst C E* v 95 -**89**, *L'Ingeg Civil* -**88**

POLLET swing. See BRIDGES, draw-bridges

PONTOON, Indian boat, Fenner *R & Eng* \* Sep -**88**

PONY lattice. N.Y.. West Shore & B. R. *R Gaz* \* Sep 21-**88**

PORTABLE. Brochocki's *Eng* \* Apr 5; Paris exhib. \* Aug 2-**89**; *E News* May 26 \* Sep 1-**92**; French iron. Talansier *E Rec* \* Jan 12-**89** \* *Genie Civil*; metallic, for quick erection, Pichault, abs. *Inst C E* v 91 -**88**, *Assoc Ings Liege* -**87**

PORTAL bracing, anal. of stresses. Cain *E News* July 13-**89**

PORTSMOUTH & Gosport floating, Harris *Eng* \* Oct 7, *E Rec* Oct 15, *Sc Am Sup* \* Nov 19, *The Eng* \* Sep 23-**92**, *Inst M E*

POUGHKEEPSIE, cantilever, Hudson river, construction, O'Rourke, insets (full) *Am C E* \* v 18-**88**, inset *E & Min* Feb 2-**89**, *E News* Jan 7-**88** \* Feb 16-**89**, abs. *Inst C E* v 96 -**89**, T. Clarke *Sc Am Sup* \* May 19-**88**, *The Eng* Sep 21-**88**

PROVIDENCE, R.I.. Point st., guard gates, Bullock, insets *Am C E* \* v 20-**89**, *E Rec* \* Nov 28-**91**

QUERETARO aqueduct, Mexico *E News* \* June 2-**88**

QUINDARO. caissons and cribs, inset *E News* \* Apr 4-**91**

RADIAL truss, F. Smith, cor. *E News* \* Apr 11-**91**

RAILROAD, wts. of, Du Bois, inset, new form of strut. Strobel *Am C E* \* v 18-**88**; Am., Cooper, discuss., insets (very full) \* v 21, 21 -**89**; R. bed for bridge structures. Woolson *Am M E* \* v 9 -**88**; bridging canons lengthwise. Hinckley, inset \* v 26-**92**; Burge, Walton, Cruthwell *Eng* Mar 7-**90**; Am. viaducts. Greiner \* Aug 14-**91**; Glenury viaduct renewing in Scot.. Caled. R., inset \* Sep 2, Earn viaduct \* 16-**92**; Am.. Cooper. (full) *E & Min* \* Oct 5-26 \* Nov 2, 9, 30-**89**, do. *E News* \* July 6-**89**; Am.. origin and evolution, Greiner \* June 6-**91**; use of steel for, symposium. Mar 26. Apr 2. Aug 25-**92**; wrt.

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iron floor beam, test, Boller *E Rec* \* Dec 10-**87**; new form of strut, Strobel, abs. *Inst C E* v 95-**89**; Dufferin, Hawkesbury, discuss., insets (full) \* v 101-**90**; Am., origin and evolution, Greiner *R Gaz* \* June 5-**91**; recent construction of, Ritchie *Sc Am Sup* Jan 17-**91**, *J Assoc Eng Soc*; spacing cross-girders in, MacKensie *The Eng* \* Mar 6-**91**; Moenchenstein failure, Switz., Ende \* Feb 19-**92**. See also under BRIDGES, Howe truss, and names of places and railroads, Forth—Loa—London, Blackfriars—Oakley, etc.; PILING; TRESTLES  
DESIGNING, disputed points in, Waddell, discuss., insets (very full) *Am C E* \* v 26-**92**, *E News* Dec 12, 26-**91**, *E Rec* Dec 12, 26-**91**, Jan 9-**92**, *R Gaz* Oct 14, 28, Nov 4, 25-**92**

GUARDS, inside and outside, Dailey *E News* \* Jan 28, 28-**88**; rerailing, Buf. Roch. & Pitts. \* Sep 13; guard rails, McNicol, cor., ed. \* Oct 4, 4-**90**; St. R., Holland \* Mar 7; Cleveland rerailing guard \* Apr 11-**91**; Dutch St. R., Post *R & Eng* \* Apr; the Tilden \* Sep -**91**; Sav. Fla. & W. standard *R Gaz* \* Jan 17; and rerailer, Plant system \* 31-**90**; location of guard rail \* Feb 6-**91**

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LOAD diag. for stresses in asimont *E News* \* Mar 10-**88**; panel concentrations due to engine loads, Szlapka, cor. Dec 6-**90**

RERAILER, Locke's protector *E News* \* Dec 27-**90**; Cleveland rerailing guard \* Apr 11-**91**; Post's *R Gaz* \* Mar 13-**91**. See also BRIDGES, railroad, guards

STRAINS, produced by loaded cars of 90,000 lbs. capacity, Blakely cor. and ed. *E News* May 10-**90**. See also BRIDGES, strains and stresses

TIMBER structures, western Am. *Eng* \* Sep 23, Howe truss 180 and 250-ft. span, inset \* Oct 7-**92**

RAO Shri Pragmalji, Mandvi, Kutch, Sykes *Inst C E* v 103-**91**

RED river concrete piers. Purdon *E News* \* June 2-**88**

RED Rock cantilever, Col. river, At. & Pac. R., foundations *E News* \* Sep 27; Waddell, inset detail sheet \* Oct 4, 4, correction, 11-**90**; Rowe *E Rec* Dec 19, 26-**91**, erection \* May 7 \* July 2-**92**, *Am C E*; abs. *Inst C E* v 103-**91**

RIPARIA, Snake river, Wash. T. *Eng* \* Nov 6, *Sc Am Sup* \* Dec 19-**91**

**Bridges, RIVERMONT, Lynchburg, Va.** *E News* \* Feb 21-**91**ROCHESTER, N.Y., Driving Park ave., Genesee river *E Rec* \*July 18 \* Aug 1, *R Gaz* \* July 17-**91** \*ROCKFORD, Ill., State st. plate girder highway, inset *E News* \* Feb 27-**92**ROPE and military applics.. Gisclard *Sc Am Sup* \* Oct 17-**91**, *Genie Civil*RULO, report, Morison, bk. review *R & Eng* Feb -**91**ST. Guistina viaduct, So. Tyrol, inset *E News* \* Feb 1, 1-**90**ST. JOHN cantilever *E Rec* \* Mar 16, 30-**89**ST. LAWRENCE river, Lachine, Can. Pac R., inset *Eng* \* Apr 13 -**88**ST. Louis, Mo., Merchant's, Miss. river, inset *Eng* \* May 15, inset \* June 5, 5, inset \* 12-**91**, inset *E News* \* Dec 21, 21 -**89**; Grand ave., inset \* July 18-**91**; Maline Creek \* Feb 20 -**92**; Grand ave (suspen.) *E Rec* \* June 6, 20, 27 \* July 4 \* Aug 8-29 \* Oct 3, 10-**91**ST. Mary's Falls, Sault Ste. Marie, wind strains on, diags. *E News* \* May 25-**89**; Massy \* Oct 18-**90**; canal and dam *E Rec* \* Mar 22-**90**ST. Paul, Minn., Miss. river high br. *E Rec* \* Feb 16, 23, Mar 2 \* Apr 6 \* May 11 \* July 20, erection \* Dec 21, 28; Col. st. skew arch \* Nov 23-**89**; Wabasha st., erection \* Dec 26-**91** \* Jan 16-**92**ST. Peters, Dadore river *E Rec* Aug 10-**89**SIBLEY, Missouri river, Chic. S. F. & Cal. R., Chanute, discuss., insets (full), construction, Wallace, superstructure, Breithaupt *Am C E* \* v 21, 21-**89**, *Eng* July 5, 5-**89**, *E News* \* Feb 18-**88**, abs. *Inst C E* v 99-**90**, (dates) n *R Gaz* Feb 17-**88**SIEE Ho, China R. *The Eng* Feb 3-**88**SIOUX City, Monson report, pph. *R & Eng* \* May -**91**, *R Gaz* Oct 3-**90**SKEW portals *E News* Apr 27, Leschorn, cor. \* May 18-**89**SKIPTON & Ilkley, England *The Eng* June 15, 15-**88**SOULEUVRE viaduct, France, Vire, St. Lo. & Caen R., piers *E News* \* June 28-**90**, *E Rec* \* Jan 10, 17-**91**, *Genie Civil*.*R & Eng* \* Mar, *Sc Am Sup* \* Apr 5, *The Eng* \* Jan 24-**90**SMITHVILLE, Mo., Chic. Kan. C. & Tex. R., inset *E News* \* Jan 24-**91**STAGING for girders bridges *The Eng* June 1-**88**STARRUCCA viaduct, N.Y. L. Erie & W. R. *E News* \* Sep 1-**88**

- Bridges, Steel** compression members, strength, expts., Dagron *R Gaz* Jan 6-88, *Am C E* -87
- STEUBENVILLE, P. C. & St. L. R., temporary support, renewing pier *E News* \* July 12-90
- STOCKTON-on-Tees, Victoria br., Neate *E News* \* Sep 8-92, *Inst C E*
- STONE. See ARCHES; BRIDGES, arched and names
- STRAINS and stresses. Booth *Am C E* v 20 -89; greatest truss stress and position of load, etc., Eddy, inset (very full) \* v 22 -90; slide moment diag. for computing, Greiner *E News* Apr 14; web stresses with curved chords. Lindenberger, cor. \* 21 -88; safe stresses in Ottewell, diag. \* Feb 23; allowable strains in old, Fowler, cor. Apr 6; strains cal. by graph. method, Baldwin, diag. \* Sep 28 \* Oct 12-89; device for cal. strains. Howe, Jan 11; mechan. comput. of stresses, Fletcher \* Mar 1, May 10, do. Webb, cor. \* Apr 12; strains produced by loaded cars of 90,000 lbs. capacity, Blakely, cor. and ed. May 10; method of cal. strains in Whipple truss, W. Baldwin (math.) \* Aug 30-90; computing strains, German practice, Waddell Dec 12-91 \* Feb 27-92; secondary stresses in framed structures. Hiroi *R & Eng* \* Oct -88
- STREET'S Run viaduct. Pitts. Vir. & Charleston R. *E Rec* \* Mar 26-92
- SUBAQUEOUS viaduct *E News* \* Feb 28-91
- SUKKUR cantilever. Indus river, Parsey, inset *Eng*\* Mar 9, 9-88, inset \* Jan 4-89; erection *E Rec* \* Apr 9-23-92; the Lansdowne. Robertson, insets *Inst C E* \* v 103-91, do. *The Eng* \* Jan 9-91
- SUSPENSION, and flume for lumber transport, Cal. *E News* \* Apr 11-91; proposed new system, Steiner, cor. \* Mar 12-92. See also under Bridges, names.
- SUSQUEHANNA river, Phil., Harrisb. & Pitts. R. *R Gaz* \* Feb 12 -91
- SWISS No. Eastern standard plate girder *E News* \* Mar 26-92,
- TARANTE, Italy, n *Sc Am Sup* \* Jan 14-88
- TAVISTOCK & Shillamill viaducts, Plymouth & S. W. Junction R., England *The Eng* \* June 6-90
- TAY viaduct, Dundee, Barlow *Eng* May 18-88, discuss., insets *Inst C E* \* v 94 -88, construction, Inglis *R Gaz* June 29-88
- TESTING, Nansouty, Cuenot, abs. *Inst C E* v 108 -92, *Genie Civil* \* v 19 -91, *An Ponts* July -91

- Bridges**, Thames river, New London, Ct., N. Y. Prov. & Boston R., inset *Eng* \* Apr 10 \* May 8, 15-**91**; *E News* May 19-**88**; *E Rec* \* Oct 11, 18-**90**; *R & Eng* \* June -**88**, Nov -**89**, report, Nov -**90**; draw-br. pivot pier *R Gaz* \* Nov 7-**90**; lower single span, opening, proposed *The Eng* \* Mar 18-**92**. See also BRIDGES, draw-bridges
- TIDE-water Pipe Co. suspen., Mauch Chunk, Pa. *E News* \* Feb 25-**88**
- TIMBER rolling-br., in Drowtheim, Cauer, abs. *Inst C E* v 92 -**88**, *Zeit Bauwesen* -**87**
- TORKHAM, India, launching of, Ollonbach *The Eng* Jan 13-**88**, *Ind Engr*
- TOWER, London, inset *Eng* \* Sep 23-**92**; *E News* \* July 6-**89**; *E Rec* May 21-**92**, *R & Eng* \* Oct -**90** \* Oct -**92**, \* *Industries*; *The Eng* \* Aug 16, 30, 30, Sep 6, 6 \* Oct 18, 18 \* Nov 8, 8, 15 \* Dec 20, 20-**89** \* Apr 17-**91**
- TRANSANDINE, inset *Eng* \* Dec 2-**92**
- TRANSFER, Harsimn's Cove, Jersey City, Bensel, discuss., insets *Am C E* \* v 19 -**88**
- TRESTLES. See TRESTLES.
- TRUSSES, formulas for wt. of, Du Bois *Am C E* \* v 18-**88**; abs. do. *Inst C E* v 96-**89**; failures in 1889 and for 11 years, ed. *E News* Apr 19, 19; arch, Gilman, Aug 16-**90**; truss deflection, J. Johnson *R Gaz* Aug 1-**90**
- TURIN, Po river, Margherita, abs. *Inst C E* v 92 -**88**, *Giornale Civ* -**87**
- TWO MEDICINE, Great No. R., St. Paul, Minn. & Manitoba R *E News* \* Mar 19-**92**
- TWYFORD viaduct, Didcot, Newbury & Southampton R. *The Eng* \* Dec 18, 25-**91**
- VAN BUREN, Ark. river, construction, Purdon, discuss., insets (full) *Am C E* \* v 20 -**89**, piers erection, do *E Rec* \* Jan 11-**90**
- VANDEVANDA, Penn. R. *E News* \* Jan 12-**89**
- VERRUGAS viaduct, Oroya R., Peru, inset *Eng* \* Apr 17; Olcott *E & Min* \* Jan 24-**91**; *E News* \* July 27-**89** \* May 9-**91**
- VIAUR, Du., viaduct Carmaux & Rodez R., proposed, inset *E News* \* Nov 30, 30 *R & Eng* \* Nov, *Genie Civil*; *The Eng* \* Dec 27-**89**
- VICTORIA, Stockton-on-Tees, Neate, inset *Inst C E* \* v 109 -**92**; Kilmarnock *The Eng* Aug 30-**89**
- VIENNA, Stephanie, Danube canal, abs. *Inst C E* \* v 92 -**88**, *All Bauz* -**87**

- Bridges**, WASHINGTON, Harlem river, 181st st., N. Y. city, W. Hutton (bk.) *E & Min* \* Sep 27-**90**; designs, inset *E News* \* Dec 27-**90**; (Manhattan bridge) Hutton, bk. n *E Rec* Jan 31-**91**
- WEEHAWKEN viaduct and pass. elevators, T. Brown, Blakeley, insets *Am CE* \* v 27-**92**, inset *R Gaz* \* Jan 22-**92**
- WEIGHTS of, DuBois, inset *Am CE* \* v 18-**88**; formulas, Moss-crop *E News* Mar 17-**88**
- WHARFEE river, Yorkshire *The Eng* May 25-**88**
- WHITE's plate girder, Del. Lack. & W. *R & Eng* \* July -**91**
- WILLAMETTE river Howe truss timber, Albany, Or., Or. R. & Nav. Co. *R Gaz* \* Apr 19-**89**, *Sc Am Sup* \* Mar 17-**88**, *Eng*
- WINNER, Kansas City, Mo., details, inset *E News* \* Mar 15, inset \* July 19, 19-**90**
- Bridging** canons lengthwise, Hinckley, insets *Am CE* \* v 26-**92**
- Bright**, Charles T. (full) *El Rev Lond* May 11, *Inst CE* v 93-**88**, por. *Sc Am Sup* \* July 7, *The Eng* May 11-**88**
- Briquette**-making machine, Paris exhib. *Eng*\* May 24-**89**
- British** Assoc. pro., elec. papers, Lodge *El Eng* Nov -**88**, *Electric Lond*; Bramwell addr. *El Rev Lond* Sep 7, Preece, Fitzgerald (full) 14-28, Oct 5-19-**88**, (full) Sep 20, Anderson addr. \* 27 \* Oct 4, 11 \* Nov 8-**89**, Abel addr. (full) Sep 5 \* 12, 19, 26 \* Oct 3, 10 \* 24, 31-**90**, Huggins addr. Aug 21, 28 \* Sep 4, 11, Oct 30, Dec 11, 25-**91**, (full) \* Aug 12-26 \* Sep 2, 23 \* Oct 7-**92**; Lodge, Pres. addr. *El Wld* Oct 3-**91**
- Eng* Sep 14-28, Oct 5-26, Nov 2-**88**, official local guide. Newcastle, bk. review Sep 6, ed. 13, 20, 27, Oct 4-25-**89**, Aug 22, Abel, Pres. addr. Sep 5-26, Oct 3-17-**90**, Roberts-Austen, Pres. addr. Aug 21, 28, Sep 4-25-**91**, Aug 12-26, Sep 2-16-**92**
- Sc Am Sup* Dec 21-**89** \* Oct 11-25, physics at, Nov 29-**90**; *The Eng* Preece addr. Sep 7, Bramwell addr. 7-**88**, Sep 13, 20-**89**, Leeds, Abel addr. Sep 5 \* 12, Noble addr. 19-**90**, Aug 28-**91**, Unwin, Pres. addr. Aug 5-19-**92**
- FEDERATION**, Am. view, Carnegie *E Mag* Nov -**91**; mint report, 1890 *E & Min* June 6-**91**
- NAVY**, naval engineer officers, pay, etc., cor. *The Eng* Aug 22-**90**; navy (list) July 1, 8-**92**. See also **NAVIES**, Great Britain: ENGLAND; GREAT Britain
- Britton**, Hiram M. *R & Eng* Sep -**89**

- Bronze**, aluminum bronzes, diag. *E News* \* Feb 8-**90**; monumental uses of, Gardner *Sc Am Sup* \* Mar 24-**88**, *Soc Arts Lond*; Stone's pat. *The Eng* \* Apr 24-**91**
- Brooklyn**, navy yard *Eng* Oct 17-**90**. See also BRIDGES — RAILROADS, Brooklyn, etc.
- Brooks**, David, por. *El Wld* \* June 6, *F Inst* July -**91**
- Brown**, C. E. L., por. *El Wld* \* Oct 17-**91**
- Brown**, John *Inst CE* v 95 -**89**
- Brown**, Samuel *Inst CE* v 109 -**92**
- Brown**, Thomas *Inst CE* v 92 -**88**
- Brown**, William A. *Inst CE* v 95-**89**
- Brush**, Charles F.. por. *El Rev* \* Aug 2, *Harpers W* July 26-**90**
- Buarque**, Antonio L. *Inst CE* v 100 -**90**
- Buchholz**, John A. A. *Inst CE* v 101 -**90**
- Buddicom**, William B. *Inst CE* v 91 -**88**
- Buell**, Madison, por. *El Eng* \* Aug 19-**91**
- Buenos Ayres**, gas supply, Stevenson *Inst CE* v 103 -**91**
- Buffalo**, N. Y., map *Eng* \* Nov 30-**88**, *El Rev* \* Feb 20-**92**
- Buildings** and building, notes *E Mag* Oct -**91**. See also ARCHITECTURAL eng; ELECTRIC light stations; EXHIBITIONS; FOUNDATIONS; MILL construction; RAILROADS, buildings; RAILROADS, electric power stations; ROOFS, etc.
- AGRICULTURE**, World's exhib., Chic. *Eng* \* Apr 29, \* May 6-**92**
- ALLEGHENY County Courthouse** *E Rec* \* Nov 10-**88**
- ANCHORING** of, Goetz *Sc Am Sup* \* Dec 21-**89**
- ARCADE**, Cleveland *E Rec* \* Mar 21, 28 \* Apr 4-**91**
- ARMORY**, O. N. G., Cincin. O. *E Rec* \* Dec 7, 21-**89**; 12th reg't, N. Y. \* Jan 7-**88**
- ASSOCIATIONS** *Sc Am Sup* Dec 28-**89**
- AUDITORIUM**, Chicago *Eng* \* Apr 3, 24-**91**, *E Rec* \* Apr 12, construction \* Nov 22, 29-**90**, \* Feb 21, \* Mar 7-**91**; *Locom* May -**90**
- BATHS**, European public *E Rec* \* Apr 18, special bath-room \* Oct 3-**91**
- BEAM** anchoring, Goetz-Mitchell sys., com. rep. *F Inst* \* Nov -**91**
- BOILER** shop, Pitts. Locom. works *R Gaz* \* Feb 7-**90**
- BOSTON** Chamber of Commerce *E Rec* \* May 7, 28, \* June 4; building law, Aug 6-**92**
- BRIGHTON** beach hotel, Coney Is., moving *E News* Apr 7-**88**, *R Gaz* \* Apr 6-**88**

- Buildings, Chicago**, and foundations, Sooy Smith, and ed. (full) *E News* Oct 13-92; fire-proof construc. *E Rec* \* Feb 16-89; tall, construction on compressible soil, Jenney \* Nov 14; the McVickers \* June 13; Rand & McNally, construction \* Dec 12-91, \* Jan 9, 30 \* Feb 13-92. See also BUILDINGS, Auditorium, etc.
- Church**, Buffalo, large wooden dome *E News* \* June 28-90; roof truss, St. Paul *E Rec* \* Oct 27-88; spire framing and anchoring \* Jan 12-89; steeple. Asservent church \* Dec 20-90
- CITY Hall**, Kansas C., Mo. *E Rec* \* Apr 2, 16-92; the city hall in Am., Ferree, insets *E Mag* \* Nov -92
- CLEANING**, outside *E Rec* Feb 20-90
- CLUB house**, Down Town Assoc., N. Y., inset *E Rec* \* Dec 10-87; Freundshaft, N.Y. \* Dec 15-88
- COLUMBIAN** exhib., Freitag *E Mag* \* Nov -91; foundations and floors, Gottlieb *J Assoc E Soc* Dec -91. See also BUILDINGS, U. S. Gov't and under names; EXHIBITIONS, U. S. Columbian
- COLUMNS**, strength, formulas, Johnson *E News* Dec 22-88. See also COLUMNS
- CONSTRUCTION**, (safe) and slow burning, Woodbury *Eng* Apr 10-91; notes, bk. review, May 6-92; fall of Park Place, Atkinson *E Mag* \* Nov -91; fire-proof interior, Carrere \* Oct -92; anchoring beams, Goetz-Mitchell system *E News* Nov 21-91; errors in, D'Oevich *E Rec* May 12-88; fire-proof, Chic. \* Feb 16-89. See also BUILDINGS, high
- CONTRACT**, standard, com. rep. *E Rec* Sep 15-88; contractor's eng. and plant, files -88-92
- COURT house**, Allegheny Co. *E Rec* \* Nov 10-88; Custom house, National, Bell, Dec 3-87
- DOME**, Buffalo church, large wooden *E News* \* June 28-90
- DREXEL** office, Phil. *Eng* \* Nov 15-89, *E Rec* \* May 4-25-89
- EARTHQUAKE** countries, building in, Milne *E News* Jan 10-91, *Inst C E* v 100 -90
- EDGEMOOR** Bridge works shops *E Rec* \* Apr 19, 26 \* May 3-90
- EFFLORESCENCE** and impervious mortar, Baker *E News* Apr 7-88
- ELECTRIC**, World's Columbian exhib. *Eng* \* Dec 16 \* 30-92. See also EXHIBITIONS, U.S.
- FERRY house**, Barclay st., N.Y. *E Rec* \* Nov 24-88

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**FOUNDATIONS,** Columbia Elevator, Prov., new, Hawks *E News* \* Feb 25-88; Chicago, Sooy Smith, and ed. (full) Oct 13-92; heavy *E Rec* Jan 31-91, *Land Architect*; World's Columbian exhib., Gottlieb *J Assoc E Soc* Dec -91. See also FOUNDATIONS

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*E Rec* heavy, Gibson, Nov 3-88; Drexel office, Phil. \* May 4-25, do. *Eng* \* Nov 15-89; Chicago tall, construction on a compressible soil, Jenney, *E Rec* \* Nov 14-91; tall, safe construction, W. Smith, Apr 9; wind bracing in, Quimby, Nov 19, Dec 31 etc. -92

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**HOSPITAL,** Boston City *E Rec* \* Jan 4-90; Children's, Berlin \* Sep 8-88; Ogden, Utah \* Feb 7-91; portable, or barracks, Nieden's *Sc Am Sup* \* Jan 14-88

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**LAW,** use, J. Robinson *E Mag* Aug, Sep, Henry, Nov -91; enforcement, T. Clark *Tech Q* Sep -87, Feb -88; National regulations, proposed *E Rec* Apr 25-91; Boston, Dec 20-90, Aug 6-92; Bridgeport, Aug 31-89; N. Y. Apr 30-92

- Buildings, Library**, Newark, N. J., insets *E Rec* \* Oct 26-**89**; Tilden Trust, N.Y., proposed, Bigelow *Scribner's* \* Sep -**92** MACHINERY Hall, Paris exhib. *E Rec* \* Aug 24 \* Sep 7, 21, 28 \* Nov 2-**89**; World's Columb. exhib., details \* Nov 19, 26 \* Dec 24, 31, etc. -**92**. See also EXHIBITIONS, U. S. Columbian MADISON Sq. Garden, N.Y. *E Rec* \* Aug 30 \* Sep 20, 27-**90**, \* Jan 17, 24, 31, plumbing \* Apr 11-**91** MANUFACTURES, World's Columb. exhib., inset *E News* \* Sep 1 -**92**. See also EXHIBITIONS, U. S. Columbian MARKET Hall, La Plata, Ende *The Eng* \* Nov 28-**90** MASONIC Temple, Chic. *Eng* \* Aug 7-**91** MATERIALS, market, '89 *E & Min* Jan 4-**90**; Xylolith (wood-stone), new *E News* \* July 28-**92**; normal working loads, com. rep., tables *E Rec* Dec 14-**89**, do. Austrian Assoc. of Engr's, abs. *Inst C E* v 97-**89**, *Woch Ost Ing* -**89**. See also BRICK; CEMENTS and mortars; COLUMNS; CONCRETE: MATERIALS; PLASTER; STONES; TIMBER; WOOD, etc. MAUSOLEUM, or campo santo, N.Y., (full) *Sc Am Sup* \* Jan 4-**90** METROPOLITAN opera house, N. Y., construction *E Rec* \* June 13; St. Paul, Minn. \* July 11-**91** MILL, construction details, Hutchinson, inset (full) *E News* \* Nov 10-**92**. See also MILLS MONMOUTH Park Assoc., N. J., grand stand *E News* \* Jan 18, inset \* Mar 29, 29-**90** MOVING, Brighton beach hotel, Coney Is., N. Y. *Sc Am Arch edition* \* May -**88**, *The Eng* Apr 27, 27-**88**, masonry, and raising *The Eng* \* Dec 30-**92** MUSEUM, and arrangement, Ferree *E Mag* \* Nov -**91** N. Y. Music Hall *E Rec* \* July 4-**91**; N. Y. World (Pulitzer) *E Rec* \* Nov 1, 8, 15-**90**, do. *Sc Am Sup* June 13-**91**; Western Elec. Co.'s *El Eng* \* Apr -**89** OLYMPIA, Nat. Agric. Hall, roof erection, Read *Eng* \* Dec 28 -**88** ORCHARD house *Sc Am Sup* \* May 19-**88** PALACE of Chapultepec, Mex., grand stairway *E News* \* May 11-**89** PARIS Post Office *Sc Am Sup* \* Aug 25-**88** PAVILION, Coney Is. *E Rec* \* Nov 9-**89** PHœNIX girder shop, Pa., framing *E Rec* \* Apr 7-**88** PRISONS, French *E Rec* \* Oct 6-**88**; Lack. Cty. \* Nov 30-**89**

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- Buildings**, PONCE de Leon hotel, Fla., concrete construction *E News* \* Mar 16-**89**
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- PROTECTION, electric, against water overflows, Weil *F Inst* Oct -**88**. See also FIRE protection
- REPAIRS and restoration, hints to workmen *E Rec* Nov 19-**92**
- RIDING School, 75th st. N. Y., elevated ring *E Rec* \* June 16-**88**
- ROOF water removal, Porter *E Rec* May 4-**89**, *Tech Q* \* Feb -**89**. See also ROOFS
- ROOKERY, Chicago *E Rec* \* Nov 3-**88**
- ST. Augustine, Fla., concrete construction, Ponce de Leon, etc. *E News* \* Mar 16-**89**
- ST. Mark's, Venice, Scott *Sc Am Sup* Jan 7-**88**
- SKYLIGHT, dome, No. West Life Ins., Mil. *E Rec* \* July 6-**89**
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- STEEL works, Homestead, Press shops *E News* \* Nov 10-**92**
- STONES, and decorative, of Egypt *E & Min* Feb 25-**88**; British, crushing strength, Beare (full) *E News* \* Sep 22-**92**, do. inset *Inst C E* \* v 107-**92**; N.Y., report *Sc Am Sup* Dec 31-**92**. See also STONES and names of material, as GRANITE, etc.
- STOREHOUSE construction, standard, Woodbury *E & Min* Apr 4, \* Sep 26 *E News* \* Oct 17 *E Rec* \* Sep 19 *Sc Am Sup* \* Oct 24-**91**
- SUBURBAN summer communities, Wingate *E Mag* \* Sep -**92**
- THEATRES construction and arrangement, Hexamer *F Inst* July -**92**
- TRANSPORTATION, World's Columb. exhib. *Eng* \* Dec 2, 9-**92**; inset *E News* \* Dec 29-**92**. See also EXHIBITIONS, U. S. Columbian
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- WATER closet, London public *E Rec* \* Mar 19-**92**
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- Bull's** patent metal *Eng* July 26-**89**, *The Eng* May 25-**88**
- Bullet** probe, telephonic, Girdner *Sc Am Sup* \* Mar 3-**88**
- Bullmore**, Frederick *C. Inst C E* v 92-**88**
- Bullock**, Milan C., por. *E & Min* July 25-**91**
- Burglar's** kit *Sc Am Sup* \* Oct 4-**90**

- Burial**, sanitary disposition of the dead, Harvey *F Inst* Nov -89; entombment, Mausoleum Co's system, com. rep. \* Apr -90
- Burnett**, Arthur W. *Inst C E* v 103 -91
- Burnham**, N. F. (turbine inv.), por. *Sc Am Sup* \* Mar 28-91
- Burrell**, Percy *Inst C E* v 103 -91
- Butter**, composition, Vieth *Sc Am Sup* Mar 14-91; extractor *The Eng* \* June 28-89
- Buttle** bodies nature, Kick, abs. *Inst C E* v 100 -90, \* *Tech Blatter* -89
- Butts**, Elijah P. *Am C E* v 26-92

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*E News* electric and animal power, relative econ., cen. bull, report, May 23, Badger, Oct 24; life of grip-faces and cables. July 11; carrying across a draw-bridge, proposed method, Church's, Sep 19; elec. and horse, relative econ., Badger, Oct 24; motive power, prog., J. Robinson, Nov 7-91, do. com. report *E Rec* Feb 20, 27, Mar 5, 12, 19, Apr 16; elec. and horse, relative cost of op., report, Oct 29-92

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- Cable** Railroads, BIRMINGHAM, England, st., ed. *Eng* Mar 30, *Sc Am* Nov 3, *The Eng* June 22, 29, Sep 28, 28-**88**
- BROOKLYN bridge, N. Y., Leverich, insets *Am CE* \* v 18-**88**, inset *Eng* \* Oct 5 \* 26, Nov 9, 16, 30-**88**, abs. *Inst CE* v 95-**89**; terminals, com. report and ed. *R Gaz* \* Apr 27-**88**, (full) *St RJ* \* July, grip \* Dec -**90**
- CALIFORNIA, in, Van Vleck *Eng* \* Jan 9-**91**. See also CABLE R., Oakland, San Diego
- CHICAGO, No. & Western *St RJ* \* May -**90**
- CLEVELAND City *St RJ* \* June -**91**
- CROIX-Rousse, Lyons *The Eng* Dec 7-**88**
- EDINBURGH No. Tramways *E News* \* July 20-**89**, Colam (full) *St RJ* \* Jan -**91**, *The Eng* \* Aug 8, 8-**90**
- FRENCH *R & Eng* \* Jan -**89**, *Genie Civil*. See also CABLE R., Havre
- GREAT Britain, and electric, McCallum *St RJ* Oct -**92**
- HAVRE, Foris, abs. *Inst CE* v 106-**91**, *Genie Civil* \* v 19-**91**
- HECKERT system *St RJ* \* Aug -**88**
- KANSAS City *E News* Dec 8-**88**; traction, effic. diag. \* May 3 -**90**; *St RJ* \* Jan -**88** \* Feb -**90**
- LIGHT road construction, Van Vleck *Am ME* \* v 11 -**91**, *E News* \* Nov 22, roads \* 29 *St RJ* \* Dec -**90**
- LONDON, England, electric and *El Rev Lond* Sep 16-**92**
- Los Angeles, Cal. *Eng* \* Aug 28-**91**; cable viaduct *E News* \* Jan 25-**90**; Nov 7-**91**; single-post viaduct, Hawgood, Temple st., Wood, inset *Inst CE* \* v 107 -**92**; *Sc Am Sup* \* Oct 10-**91**; *St RJ* \* Mar, Temple st. Co. \* Sep -**90**
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- Mt. S. Salvatore, near Lugano, Switz., Strub, abs. *Inst CE* v 110 -**92**, \* *Schweiz Bauz* -**92**
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- MULLER traction system *St RJ* \* Dec -**92**
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- OTIS elevating R., Catskill mts. incline, inset *E News* \* Aug 18 \* Sep 8, *R Gaz* \* Aug 12, 26-**92**

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- Cable** Railroads, PARIS, the Belleville *Sc Am Sup* \* Sep 6-**90**, *Genie Civil*
- PHILADELPHIA Traction Co., conduit, Wagner *F Inst* \* Feb -**88**
- ST. LOUIS, inclined, for frt. car transfer *R Gaz* May 20-**92**; plant *St RJ* \* June -**91**
- SAN DIEGO, CAL., Van Vleck *St RJ* \* July -**91**
- SWISS, Strub *R Gaz* July 8-**92**, *Schweiz Bauz*
- TERRY system *St RJ* \* May -**89**
- VOGEL system, conduit and grip *E News* \* Jan 31-**91**
- WASHINGTON & Georgetown R. power station *St RJ* \* Dec -**91** \* Sep -**92**
- WHITE'S, R. T., conduit *E News* \* June 20-**91**
- Cacao** (chocolate bean), Curtis *Sc Am Sup* Mar 15-**90**
- Caffeine**, action of (full) *Sc Am Sup* June 21-**90**. See *LAPICQUE*
- Calculating** machine, Felt's *Sc Am Sup* Oct 27-**88**. See also *CENSUS* tabulating, Hollerith machine
- Calculation**, mental, Bidder. Pole *Inst CE* v 103 -**91**, remarkable feat of. do. *E News* Sep 19-**91**; multiplication, quick method, Fuller, cor. Jan 30-**92**
- Calendar**, perpetual, McFarland's *Sc Am Sup* Apr 11-**91**; old style and new (reckoning) *Locom* Oct -**90**
- Calorimeters**, simple, Peabody *Am ME* v 10 -**89**; errors of different types. do., an universal, Barrus \* v 11, 11-**90**; notes, Carpenter \* v 12 -**91**; Barrus' universal *E News* \* May 31-**90**; new, Peabody *F Inst* \* Aug -**88**; for testing fuels on a small scale, Donkin *Inst CE* \* v 102 -**90**, do. *The Eng* \* Jan 9-**91**; Heisler throttling *Pwr* \* Feb -**91**; steam, for locom. use, ed. *R Gaz* Jan 22-**92**; Peabody *Tech Q* Oct -**88**, errors, expts., do. Feb -**90**
- Cameron**, John *Inst CE* v 109 -**92**
- Camp** stove *E News* \* Nov 1-**90**
- Camphiers**, Gerrit W. *Inst CE* v 109 -**92**
- Cams** cutting, new proc., Gabriel *Am ME* \* v 13 -**92**, *Iron Age* \* Dec 8-**92**
- Canada**, Sudbury ore-deposits, Ont., Peters *Am Min* v 18 -**90**; reciprocity with, Wiman *E Mag* Oct, Dec -**92**; province of Manitoba *E News* Jan 5; eng. works, Keefer, 26; and U. S., pop. growth, 1790 to 1880, Apr 27; water-works of. ed. and drag. \* 27, 27, May 4-**89**; census, ed. Nov 14-**91**; notes. Nov

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**3-92**; mineral resources, ed. *The Eng* Jan 2-**91**. See also MINES; QUEBEC; RAILROADS, Can. Pac., etc.

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**AMERICAN Isthmus** interoceanic commun., Barroll, maps (full) *R & Eng* \* Apr — \* Aug -**90**

**BALTIC & North Sea**, floating elevator, inset *Eng* \* Feb 20; *E News* \* Aug 1, Oct 17-**91** \* Mar 26-**92**; *R & Eng* \* Apr -**91**, *Mittheil Seewesens*

**BELGIUM**, canal du centre, hydr. lift at La Louviere *Eng* \* Oct 12-**88**; river and other works in Bel., France and Germany, Vernon-Harcourt, discuss., insets (full) *Inst C E* \* v 96 -**89**

**BIRMINGHAM & Liverpool** ship, proposed *E News* Oct 25, *R Gaz* Oct 3, map *The Eng* \* Sep 26-**90**

**BOISE** river, Idaho *E News* \* Apr 26-**90**

**BOATS** haulage and Bovet's magnetic pulleys *E I Rev Lond* \* Oct 21-**92**; propulsion, a suggestion in, Vogt *Sc Am* Mar 16-**89**; traction by cable *Sc Am Sup* \* Jan 26-**89**. See also CANALS, cable towing on

**BRUGES** maritime *The Eng* \* June 17-**92**

**CABLE** towing in France *R & Eng* \* Apr; Chatelier \* Nov -**89**, Goodwin, cor. Feb -**90**; *Sc Am Sup* \* Jan 26-**89**

**CASCADES**, locks *E Rec* \* Oct 8, 15-**92**

- Canals, CHICAGO** drainage *E News* \* June 2, 30-**92**  
**CORINTH** ship, St Yves, Greece *E News* \* Jan 17-**91**, abs. *Inst C E* v 96-**89** \* *An Ponts* v 16-**88**; *R & Eng* Sep -**90**; *Sc Am Sup* July 14-**88**  
**DOLORES**, Col., head gates and boom, inset *E News* \* Jan 4-**90**  
**EMS-JADE**, Kurs, abs. *Inst C E* v 92-**88**, *Deut Bauz* -**87**  
**FINLAND**, roads and railroads, Strukel, abs. *Inst C E* v 99 -**90**, *Allgem Bauz* -**89**  
**FORTH & Clyde** ship, Scot., proposed *Eng* Feb 14, Crawford, Aug 29-**90**; *E News* Dec 14-**89**, Apr 25-**91**  
**FRANCE**, cost of motive power on, *E News* June 14-**90**; river and other works, Vernon-Harcourt, discuss., insets (full) *Inst C E* \* v 96 -**89**; internal nav. in *R & Eng* Jan -**90**. See also **CANALS, Havre**  
**GANGES**, lower, failure of Kali Nadi aqueduct, Thelnall, abs. *Inst C E* v 95 -**89**, construction, Good, inset \* v 105 -**91**  
**GERMANY**, Belgium, France, river and other works, Vernon-Harcourt, discuss., insets (full) *Inst C E* \* v 96 -**89**  
**GREAT Britain**, Soc. of Arts conference *R Gaz* July 27-**88**; inland nav., Clements *The Eng* Aug 15, 22-**90**  
**GREAT Western** ship, England, proposed, map *Eng* \* Oct 12-**88**  
**HAGUE**, renewal of water in, Pichler, abs. *Inst C E* v 95 -**89**, *Woch Ost Ing* -**88**  
**HAVRE** to Tancarville, Widmer, abs. *Inst C E* v 110 -**92**, *An Ponts* May -**92**; *Sc Am Sup* \* Sep 15-**88**, *La Nature*  
**HUDSON** river ship and great lakes, North *E News* May 5, *Forum* May -**92**. See also **CANALS, Lakes**  
**INDIA**, ed. *Eng* Oct 14-**92**  
**JURAPA** irrig., Finkle *E News* \* May 17-**90**  
**KIOTO & Lake Biwa**. Japan *Eng* \* Jan 25-**89**  
**LAKES**, Erie & Ohio river ship, proposed *E News* \* Mar 21, do. *R Gaz* Apr 10-**91**; Great lakes & Atlantic seaboard enlarged waterway, Corthell *Eng* July 17, 24, do. *E News* Apr 18 \* 25, do. (very full) *Sc Am Sup* July 4-**91**, *J Assoc E Soc*; Superior & Mich., proposed, maps *E News* \* Mar 22-**90**  
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LIVERPOOL & Birm. See CANALS, Birmingham

LOCKS, accident, Sault Ste Marie *E & Min* \* Aug 30-**90**; of 20 metres (65 ft.) lift, Fontaine's *E News* \* Sep 19-**91**; Cascades *E Rec* \* Oct 8, 15; gates, distrib. of beams in, Stoney *The Eng* \* Apr 1; adjustable and weir, Hale, cor. \* May 6-**92** MANCHESTER ship, ed. *Eng* June 8, 15, 29, July 20, Sep 7, 21, Oct 5, ed. Dec 21, 28-**88**, Apr 25, Wins \* Aug 29 \* Dec 5-**90** \* Jan 16 \* Feb 13, 27 \* Mar 13, 27 \* Sep 11 \* Oct 2, ed. Dec 4-**91**

*E Mag* Dunell \* Nov, Dec -**91**; and Corinth *E News* June 30, July 28, Aug 4 \* Sep 29-**88**, profile \* Jan 11-**90**; *E Rec* \* Sep 29 \* Nov 17, Dec 8, 15-**88**, Feb 16 \* June 8, 15, July 27 \* Sep 7 \* Oct 5, 26-**89**; mechan. appliances, Wins. insets *Inst M E* \* July -**91**; Harrison *Locom* Dec -**89**; *R & Eng* \* Oct -**90**; *R Gaz* Sep 14-**88**, Hansel, map \* Aug 19-**92**; Wells *Sc Am Sup* Feb 16-**89**, map \* Aug 16-**90**

*The Eng* Wells, Sep 21, and Barton aqueduct, Nov 2-**88**; \* May 24-**89** \* Jan 31, map \* July 11 \* Aug 22 \* Oct 10, Nov 14-**90**, Weaver river sluices \* Jan 9 \* Mar 6, 13 \* July 17, 24 \* Aug 21 \* Oct 2 \* Nov 6, 27-**91**, prog. \* May 13 \* Aug 12, 19, Sep 16 \* Nov 18-**92**

MARNE & Saone, Florentin, abs. *Inst C E* v 105 -**91**, *An Trav Pub* -**91**

MERCED irrig *E News* Feb 4-**88**

MICHIGAN & Superior lakes, proposed, maps *E News* \* Mar 22-**90**

NEW York, state imp. *E News* Aug 18-**92**; & Phila. ship (Del. & Raritan rivers), proposed, Haupt, inset *F Inst* \* Mar -**92**

NICARAGUA ship *Eng* Menocal \* Aug 22, Dec 26-**90**

*E & Min* maps (full) \* May 4-**89**

*E News* surveys, June 16, ed. n 30, Menocal \* July 7, 14 ed. 14, Peary, Aug 18, 18-**88**, map and inset \* Sep 14, 14-**89**, proposed guarantee, ed. Feb 7, notes \* May 30, \* June 6, ed. 6, 13, 20, 27-**91**; engineer's report and ed. Dec 15, 15-**92**; *E Rec* May 23-**91**

*F Inst* and Panama, notes, Oct -**88**, Taylor, Jan, profile \* Feb, Am. Isthmian routes, Ammen, Dec -**89**; Davis, inset (full) \* July, Aug -**92**; Diebitsch *Lehigh Eng* Feb -**89**

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*Forum* Miller, Merry, Feb -92; *R Gaz* Aug 29-90

*Sc Am Sup* (full) \* Feb 2, 16, 16 \* Mar 2-89, Peary, Jan 11, 18-90

*The Eng* Feb 17-88, \* June 12 \* July 3, Aug 14, Nov 6, 27-91

NORTH Sea, Amsterdam, Huet, abs. *Inst C E* v 99-90, \* *Tijd Konin Ing* -88-89. See also CANALS, Baltic

PANAMA interoceanic ship, plant and material, Williams, insets (full) *Am C E* \* v 19 -88; Isthmus canal and our Gov't. *Atlan M* Mar -89

*Eng* Rogers Apr 20, June 8, ed. Dec 21-88 \* Jan 11, locks, inset \* Nov 1-89, directors, ed. Nov 25-92

*E News* locks, proposed \* Feb 11 \* Mar 10, actual status, profiles, ed. etc. \* June 2, 2, water supply 16, what the Slaven dredges are doing. Appleton, cor. 16, actual status, Snow, great Culebra cut, ed. \* 16, 16, recent trip over, Lockett, 23, and Nicar., ed. July 14, prog., cor. 28; Aug 11, de Lessep's report, ed. 18; plant and machinery, Williams \* 18 \* 25; financial status, ed. Dec 8-88; cost, etc. Oct 19-89

*E Rec* Rogers (full) \* Jan 28-88; McAlpine's opinion, Feb 22-90; completion, report, May 30-91; *The Eng*; works, Nansouty, abs. *Inst C E* v 92 -88, \* *Genie Civil* v 12 -88; (cost) *R & Eng* Feb \* June -91; new, Crowell, cor. *R Gaz* Oct 28-92

*Sc Am Sup* work on \* Mar 10, locks \* 31, \* July 21 \* 28 -88, \* May 25, Wins (very full) \* June 1, 8, 15-89, projects for completion, Malgarini's \* Nov 12-92

PECOS Valley, New Mexico *E News* \* Oct 17-91

PENN., L. Erie & Ohio river, proposed *E News* \* Mar 21, do. *R Gaz* Apr 10-91. See also CANALS, Lakes

QUEBEC-Montreal ship channel *Sc Am* Mar 16-89, *Eng*

RICHMOND, Va., eng. problem at, Adams *Am M E* \* v 12 -91

SAULT Ste. Marie, ed. *Eng* Sep 14-88, Sep 5-90; *E News* Jan 4, traffic for nine seasons, Mar 1-90; lock accident *R & Eng* \* Oct -90; and Suez, traffic *R Gaz* Apr 17-91; *Sc Am Sup* Oct 20-88

SIBERIA, new waterway, abs. *Inst C E* v 92 -88, *Osterreich Ing* -88; Mas *R & Eng* Sep -89, *An Ponts*

SIDHNAI system, MacLean, abs. *Inst C E* v 103 -91

SPAIN, inland nav., abs. *Inst C E* v 104 -91, *An Construct* Madrid -90

**Canals, South** Yorkshire junction, proposed *The Eng* \* Oct 17-**90**

SUEZ, traffic growth *E & Min* Apr 20-**89**; ships passed through *E News* Apr 28, June 9-**88**, report, July 6-**89**, traffic diagram \* July 11-**91**; and Sault Ste. Marie traffic *R Gaz* Apr 17-**91**; lighting of *The Eng* \* Dec 6-**89**

SUPERIOR & Mich. lakes, proposed, maps *E News* \* Mar 22-**90**  
WASTE weir, aut., Foote, inset *Am C E* \* v 18 -**88**

**Canes** and sticks manuf., Jackson *Sc Am Sup* May 11-**89**; cane contrivances \* Nov 26-**92**

**Canning** fruit *Sc Am Sup* Jan 4-**90**

**Capital** and labor, the rights of *Blackwood's Mag* Dec -**91**; conflicts, Howell, bk. review *Eng* Aug 29-**90**; the remuneration of, ed. Dec 11-**91**; does capital need high-priced labor, Partridge *E Mag* Aug -**92**; how to secure harmony between. Hewitt *E & Min* Oct 11-**90**, *Am Min*; the consumer, Rice *Forum* July -**92**; are business profits too large, Mann *Pop Sci* Nov -**92**. See also **LABOR**; **MANUF.** industries net profits

PROFIT-sharing, co-operation, B. Jones *Eng* Sep 19-**90**; industrialism, Esson *El Rev Lond* Nov 7, 14-**90**; gain-sharing Towne *Am M E* v 11 -**89**; profit sharing enterprises, ed. *Eng* Feb 13, ed. July 31-**91**, Gilman *Soc Arts Mass* -**89**

**Carbon**, bisulphide manuf. and purification, Singer (full) *Sc Am Sup* \* Apr 20-**89**; funnel, for filtering, Drown *Tech Q* May -**88**; heat of combustion, Berthelot *R Gaz* July 26-**89**, *Comptr*

**Carbonic** acid liquid manufacture *Sc Am Sup* \* June 27-**91**

**Carborundum**, Guy *Sc Am Sup* July 16-**92**

**Carnegie**, Andrew, por. *E & Min* \* July 4-**91**

**Carpenter**, R. C., por. *Cassier's* \* Jan -**92**

**Carpet** beating machines *Sc Am Sup* \* Apr 21-**88**; industry, Phil. Apr 13-**89**; weaving, Persian, Vries, Aug 29-**91**, *J Soc Arts Lond*

**Carr**, Henry *Inst C E* v 95-**89**

**Carr**, Mark W. *Inst C E* v 93-**88**

**Carriages**, elastic traction, Lemoine's *Sc Am Sup* \* Oct 8-**92**; torsion in, King *The Eng* \* Aug 28-**91**

**Carriek**, John *Inst C E* v 101 -**90**

**Cars** and carriages, Railroad, rolling stock, Paris exhib. *Eng* Aug 30-**89**, local R's, inset \* Apr 4-**90**; standards, good and bad *E News* June 9-**88**

**Cars, Accountant's Assoc. pro. R Gaz June 29-88**

AXLES, steel, Coffin *Am ME* \* v 9-88; effect of temp. on strength, Andrews *E News* \* Feb 18, 18, 25-88, Nov 14-91, do, inset *Inst CE* \* v 94-88, insets \* v 105-91; and wheels, machine for rolling, Aitken's ap., pats. *R & Eng* \* Sep-90; wheels and track, discuss. *R Gaz* Feb 17; 60,000-lb. cars, standard, proposed \* June 8-88, do. Rhodes and ed. \* Feb 22, 22, Mar 1, discuss. 29, M. C. B. \* Oct 11; steel, tests, Pencoyd works, Nov 8-89

AXLE and journal-boxes, lubricating, cost, Randolph *Am ME* \* v 11-90; stamped steel *Eng* \* June 20-90; Macnee's dust proof *E News* \* Dec 15-88 \* May 2-91; bearing for 60,000-lb. cars, M. C. B. Assoc. com. report \* June 14-90

*R Gaz* anti-friction metals, Bennett, Jan 18, 25; Erie journal box \* Sep 20; and bearings, Adams, Nov 22-89; 60,000-lb. cars, proposed M. C. B. \* June 20-90 \* June 19-91; stamped steel \* July 18; standard, proposed \* Aug 22-90; the Timms *The Eng* Apr 13-88

BRAKE, Kane's *Sc Am* Feb 16-89. See also RAILROADS, brakes  
BRUNIG, Paris exhib. *Eng* \* Aug 23-89

BUENOS Ayres & Ensenado Port, buffet smoking *The Eng* \* Feb 20-91

BUFFER, Westinghouse friction *R Gaz* \* Nov 2 \* Dec 21-88 \* Feb 21-90, *The Eng* \* Mar 14-90

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CALEDONIAN R., inset *Eng* \* Feb 21-90

CATTLE, So. R., France. wagon, Paris exhib., inset *Eng* \* Nov 8-89; the Canda *R Gaz* \* Mar 2-88

CHOCK, for stopping *E News* \* Aug 9-90

CLEARANCE in width required by *R Gaz* \* Nov 9-88

COAL, Chic. Rock Is. & Pac. standard, inset *E News* \* Aug 11-92; Tex. & Pac. *R & Eng* \* Nov-91; standard \* Apr \* May-92

COUPLERS, standard, dimens. *E News* \* Jan 28-88; contour lines, etc., Barnes \* Jan 3-91; breakages, service record and ed. \* Feb 15, 15-90 \* May 12-92; and brake legislation *R & Eng* Mar, May-92; vertical plane, in service, ed. *R Gaz* Jan 17; frt., C. B. & Q., broken \* June 6-90; vertical plane,

**Car COUPLERS**

- Barnes, and aut. air brakes \* Jan 2, Feb 6, ed. 6; what constitutes a defect in ver. plane, discuss. 23, mixed unlocking gear disadvantages \* Nov 13-**91**; strength, Forsyth, Mar 4, 11-**92**
- BLACKSTONE's platform and *R Gaz* \* July 15-**92**
- BUHOUP's *E News* \* August 25-**92**
- CHICAGO, the *R Gaz* \* Nov 14-**90**
- DREXEL *R Gaz* \* May 15-**91**
- EMPIRE *R & Eng* \* June -**92**
- FOX aut. vertical plane *R Gaz* \* June 20-**90**
- HINSON *E News* \* Aug 1-**91**
- HUSELTON aut. *R Gaz* \* Apr 11-**90**
- JANNEY frt., safety stop for *E News* \* Jan 2-**92**; *R Gaz* \* Feb 17-**88**, vs. Miller, ed. Apr 11, evolution of \* June 6, life of, diagrams of broken \* Nov 7-**90**, with Bentley's vestibule \* May 1 -**91** failures \* May 13-**92**
- KEYSTONE *E News* \* Nov 2, *R Gaz* \* Nov 8-**89**
- MASTER Car Builder's aut. *E News* introduction of, ed. Mar 28, R's equipped with, inset map \* Apr 25, 25 \* June 13, standard gauges for \* Sep 19-**91**, strength, Forsyth \* Mar 5-**92**
- R & Eng* form of contour lines, report \* May -**88**, standard gauges \* Oct -**91**, possibilities of, discuss., Eastwick (full) \* Apr, May -**92**
- R Gaz* \* Apr 20-**88**, at interchange points, ed. \* July 25 \* Aug 18, on curves \* Oct 3-**90**, broken knuckles \* Jan 2, cost, ed. May 15, report \* June 12, standard gauge \* Sep 18-**91**, M. C. B. Assoc. action, Apr 22, testing machine \* Sep 2-**92**
- ROBERT-Eastwick *R Gaz* \* June 6-**90**
- TESTING, method *R Gaz* \* Aug 19, testing machine \* Sep 2-**92**
- THURMOND frt. *R Gaz* \* June 5-**91**
- TROJAN *E News* \* Nov 29, *R Gaz* \* Dec 5-**90**
- UNION aut. *R Gaz* \* Jan 30-**91**
- VAN Dorstion and buffer *R Gaz* \* Dec 14-**88**
- DERRICK, 15-ton, Penn. *R Gaz* \* Oct 18-**89**, 10-ton, Balt. & O. \* Jan 9-**91**
- DRAW-bars, height of M. C. B. com. report *E News* June 28-**90**; Graham's draft rigging, Penn. R., discuss. *R Gaz* \* Mar 29, 29; Cushing's stop \* Oct 25; Chic & N. W. \* Nov 1-**89**; Safford aut. \* Oct 17-**90**; Butler draft gear \* Apr 1; draft gears for frt. cars, Barnes \* June 3-**92**

- Cars, DUMP**, Can. Pac. *E News* \* July 21-**88**; rotating \* July 12-**90**; iron, No. R. of France *R & Eng* \* July -**88**; the Goodwin \* July -**89**; Thacher compressed air \* Dec -**92**, do. *R Gaz* \* Nov 11-**92**; George's Creek & Cumb. \* Jan 25-**89**; and gondolas, Goodwin, Jan 31; standard, B. & A. \* Mar 7-**90**
- FRANCE**, experimental, West. R., Paris exhib. *Eng* \* Oct 4; local R's 2d class, Paris exhib. \* Nov 29; 1st class, So. R, inset \* Dec 13-**89**; State R \* July 4-**90**; pass. *R Gaz* \* May 15-**91**. See also **CARS, dump—freight**
- FREIGHT**, Goodfellow & Cushman's *Eng* \* Dec 7-**88**; unloading by steam shovel *E News* \* Oct 5-**89**; construction imp., Barnes \* Jan 30; lubrication, cost, Dec 1-**92**
- R Gaz* relative cost of car load and less, Fink, Feb 3; depreciated values, table, Apr 27: ballast and plow, Roger's \* July 27-**88**; equity of per diem and mileage plan, Yardley, Wattson, cor. Mar 15, Apr 5; relative econ. of large and small capac., ed. Apr 26; springs, bolster, tests, Hazlehurst, diag. \* Oct 4-**89**; end platforms for, ed. Jan 10: housing for gondolas and stock \* Mar 28; ventil., Pancoast's system \* Apr 11; mileage decrease on home roads, Wattson, July 11; handling and distrib. on West Shore Oct 10-**90**; Harvey steel box \* June 5-**91**; construction and design. Barnes \* Jan 29, Lamont's steel \* Feb 5-**92**
- BALT. & O. 50,000-lb. box, details *R Gaz* \* Mar 27-**91**, iron box *R & Eng* \* Dec -**92**
- BELGIUM**, Grand Cen. R. wagon, Paris exhib. *Eng* \* Oct 11-**89**
- BUFFALO**, Roch. & Pitts. 60,000-lb. box and truck *R Gaz* \* Dec 19-**90**
- CHESAPEAKE** & O., combination *R Gaz* \* Feb 1-**89**; stone \* Sep 23-**92**
- CHICAGO**, Bur. & Q. standard *R Gaz* \* June 21-**89**; & N. W. standard, 50,000-lb., box (full) \* Jan 10-**90**; Rock I. & Pac. coal, standard, inset *E News* \* Aug 11-**92**
- DENVER** & Rio Grande box, standard gauge *R Gaz* \* Oct 9-**91**
- FRANCE**, So. R. cattle wagon, Paris exhib., inset *Eng* \* Nov 8, platform wagon, do. \* Dec 20-**89**
- GERMAN** composite *R Gaz* \* Dec 27-**89**
- HOELLENTHAL** R., inset *Eng* \* Mar 13-**91**
- INTERCHANGE** rules *R Gaz* May 24-**89**, com. report, May 22-**91**
- LAKE** Shore, 30-ft. standard *R Gaz* \* Dec 30-**92**

- Cars, Freight, LEHIGH Valley, 50,000-lb. standard *R Gaz* \* June 8; twin hopper bottom gondola, 60,000-lbs. \* Sep 14-**88**; 50-ton capac. platform car \* Aug 16-**89**
- NEW York, L. Erie & W. side-dump, 80,000-lbs. capac. *E News* \* Apr 19, 19-**90**
- NEWPORT News & Miss. Valley gondola *R Gaz* \* Apr 6-**88**
- NORTHERN Pac. hopper side chute *R Gaz* \* Apr 5-**89**
- PENN. 100,000-lb. *R Gaz* \* May 11-**88**; 40-ton side-dumping gondola \* Mar 15-**89**
- SPAIN, 13-ton iron ore wagon, Parcocha R., inset *Eng* \* July 17-**91**
- TUBE-frame, Jefferds *Eng* Nov 7 \* 28-**90**, do. goods wagons, insets (full) *Inst M E* \* Oct 9-**90**, do. cor. *R Gaz* June 5-**91**, do. and effect on expenses of R's *The Eng* \* Nov 14-**90**
- GATES, the Gold platform (N.Y. eleva. R.) *R Gaz* \* Nov 30-**88**; B. & A. \* Mar 21-**90**
- GREAT So. & W. of Ireland, composite *Eng* \* Oct 19-**88**
- GREAT Western, England, corridor cars *E News* Mar 26 \* Apr 28, *The Eng* \* Apr 15-**92**
- HEATING, Bache's heater, com. report *F Inst* \* Aug -**88**; Leeland hot water heater *R Gaz* \* Sep 11-**91**; hot water continuous, Safety Co. \* Sep 6-**89**
- STEAM, notes on, Baldwin, a safety system, Towne *Am M E* \* v 9 -**88**; safe train system, Gibbs' car *El Wld* \* June 21 -**90**; appliances *Eng* \* Mar 4-**92**; Waitt *E & Min* \* Oct 1-**92**
- E News* steam from the locomotive, com. report, June 30; Baldwin \* Aug 18-**88**; non-pressure system \* May 18-**89**; by direct steam, June 7 \* Nov 22; prog. of steam heating, inset map and ed. (full) \* June 7, 7; Consol. Car-heating Co. systems \* Sep 6, do. aut. temp. regulator, 20-**90**; diagram \* May 16-**91**; standard couplings \* June 16; Waitt, Sep 29 -**92**; P. Atkinson *Lehigh Eng J* June -**89**
- R Gaz* aut. control of heat, Temple, Apr 13; expts., discuss. 20 \* May 18; Stand. Car Htg & Ventil. Co. continuous system \* June 15; M. C. B. expts., report, inset table and ed. 22-**88**; essential elements of, W. Johnson, Feb 1; continuous, cir. replies, Mar 22, Apr 12-**89**; Consol. Car H. Co. couplings \* May 2; econ. of, Sewell, Nov 7-**90**; Halladay, Sep 23, Waitt, 30-**92**; econ. of, Sewall *Sc Am Sup* Nov 29 -**90**; Lanza \* *Soc Arts Mass* -**89**, *Tech Q* \* Oct -**88**; and couplers *The Eng* Jan 27-**88**

- Cars**, Heating, Steam, CALEDONIAN R., exhaust steam ap., Drummond *Inst C E* \* v 92 -**88**, *The Eng* \* Jan 4, 4-**89**
- CHICAGO, Mil. & St. P. contin. *R Gaz* \* Jan 18-**88**, light and heat tender (full) \* June 18-**90**
- ERIE system *R Gaz* \* Feb 3-**88**
- GIBBS' safe train system *El Wld* \* June 21-**90**, steam hose coupler *E News* \* Dec 5-**91**
- GOLD continuous system, Lehigh Valley *R Gaz* \* Mar 9; storage, test, May 11-**88**; \* Aug 30-**89**; coupling and joints \* Mar 21; \* June 6; coil and Baker stove \* Dec 26-**90**
- MARTIN coupling *R Gaz* July 18-**90**
- MCELROY system, test *R Gaz* Apr 6-**88**
- NORTH Western system, coupling and trap *E News* \* Mar 30 -**89**; *R Gaz* \* Jan 27-**88**
- PENN. R., Ely *E News* \* Nov 15, *F Inst* \* Nov *R & Eng* \* Dec -**90**; Williams' system, expt. *R Gaz* Feb 24-**88**; continuous \* Mar 22-**89**
- ROBERTS' system, *R Gaz* \* Apr 17-**91**
- SEWALL contin. system, hose coupler *E News* \* Nov 21-**91**; *R Gaz* \* Jan 20-**88**
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**Corliss**, George H., por. *Pwr* \* Mar, *The Eng* Mar 23-**88**

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See also OILS, cotton-seed

**Counter**, Snelgrove's *Eng* \* Nov 21-**90**

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**Coxe**, Eckley B., Kent, por. *Cassier's* \* Dec -**92**, por. *E & Min* \* June 27-**91**

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**Cranes** and derricks. *Am C E* travelling, componential trusses  
for Seaman, insets \* v 23 -90; *Am M E* crane chains, experi-  
ences with, Dutton \* v 11 -90; hydr. trav., Graves \* v 12-91;  
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Dec 10, *Iron Age* Dec 8; Am., Suplee *Cassier's* \* Apr \* May;  
trav. elec., Leonard's control system *El Eng* \* Dec 14-92

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\* July 6; electrically worked, Anderson, Sep 14; 25-ton steam,  
Prince's Quay, Belfast har. \* Nov 9; 20-ton overhead trav.,  
Russell's \* Dec 14-88; Whitaker's steam navvy \* Apr 26;  
Paris exhib. \* Sep 13-89; 100-ton, Belfast \* Jan 24; 5-ton  
overhead trav., Belgium \* May 2; 40-ton wharf \* Sep 5; dredg-  
ing and grab, the Cockburn \* Oct 3; 100-ton trav., Fairfield  
boiler works \* 24-90; 50-ton steam Fairbairn \* June 5; locom.  
steam \* 19; derrick, stresses in, Elliott \* July 10; 25-ton trav.,  
Carron foundry \* Sep 4-91; Morgan's and lifting appliances  
\* May 27-92

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vated road erection *E Rec* \* Dec 17-87

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10; for railroad uses, Clements \* Aug 14-28-91; 100-ton elec.,  
Baldwin locom works, Bates, inset \* Jan 29; trav. elec., Shaw  
\* Mar 25-92; 10-ton trav. elec., Paris exhib. *Sc Am Sup* \*  
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*The Eng* 50-ton steam, Firming steel works, Feb 3; 150-ton  
trav., Abouchoff steel works, St. Petersburg, Feb 17, 17; 15-ton  
derrick, Butter Bros. Mar 2; 12-ton hydr. wharf, 30; 25-ton  
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1, 1; 25-ton trav., Penn. R. July 6, 13, 13; 25-ton portable steam,  
New Zealand Gov't. R's, 27; 20-ton trav. elec., working of,  
Anderson, Sep 14; block setting Hercules, Douglass harbor

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works, Dec 14-**88**; 25-ton trav., Deptford elec. light station, Aug 23; 10-ton trav. elec., Paris exhib. 30; Guyenet system. Sep 6-**89**; crane posts, stresses in, cor. \* Aug 29-**90** \* Feb 13-**91**; str., twin screw pontoon, Buarque de Macedo \* Jan 1-**92**. See also DERRICKS

**Crank**, crank pins securing, method of inserting, Collins *Am M E* \* v 9-**88**; a suggested new form of, Palmer, cor. *E News* \* Sep 6-**90**; transmission expts. *Pwr* \* Sep -**89**; the Edwards *Sc Am Sup* \* Apr 14-**88**; cranks set on an angle \* Oct 17-**91**

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**Cremation**, prog. of, Cobb *E Mag* \* July -**92**; Jenner *Sc Am Sup* July 28-**88**; of the dead, W. Clarke, May 3-**90**

**Crematory** furnace, Key's *Eng* \* Mar 15-**89**; the Manchester crematorium (dead bodies disposal) \* July 31-**91**; crematory at Zurich, Geiser, abs. *Inst C E* v 99 -**90**, *Schweiz Bauz* \* v 14 -**89**

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**Crookes**, William, por. *El Wld* \* Feb 7-**91**, por. *Sc Am Sup* \* Apr 21-**88**, por. \* Mar 7, 7-**91**, *Electrician*

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**Crosland**, William M. *Inst C E* v 99 -**90**

**Cross**, Charles R., por. *El Wld* \* Jan 3-**91**

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**Crystallization**, Liveing *Sc Am Sup* \* July 25-**91**, *Am J Sci*; crystals *Locom* Mar -**92**

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**Culvert**, Harlem arch *E News* \* Apr 26-**90**. See also RAILROADS, culverts

**Cundy**, John *Inst C E* v 109 -**92**

**Cupola** furnaces. See BLAST furnaces; FOUNDRIES

**Curran**, Henry B., por. *E & Min* \* Dec 27-**90**

**Current** meter observations, Miss. river, report *F Inst* Apr -**88**

**Curve** ranger, Trotter's *Sc Am Sup* \* Jan 11-**90** \* Dec 12-**91**, *Eng*, *The Eng*. See also INSTRUMENTS; SURVEYING

**Curves**, the false ellipse, Wurtele *Am C E* \* v 24-**91**; the logarithmic, practical uses, Cox *E News* \* Aug 29-**91**; radii of curvature geometrically determined, MacCord (full) *Sc Am Sup* \* Jan 5-19 \* June 22 \* July 13 \* Aug 3-**89** \* Jan 11 \* Oct 18-**90**, geomet. considered \* Dec 10-**92**, instruments for drawing \* Dec 28-**89** \* Mar 29 \* July 12 \* Sep 20-**90** \* Apr 4-**91** \* May 14-**92**

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See also STORMS; WIND

**Cyclostyle** duplicating ap., com. report *F Inst* Apr -**88**

**Dady**, Jamsetjee N. *Inst C E* v 92 -**88**

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**Dams**, or high walls to resist the pressure of water, Francis, discuss., insets *Am CE* \* v 19-**88**

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**AUSTIN**, Texas, Col. river *E News* \* July 11-**91**; Fanning, report, Frizell \* Sep 29-**92**

**BEAR Valley**, Cal. See DAMS, Sweetwater

**BEETALOO** water-works, So. Australia, concrete *Eng* \* July 3-**91**; Moncrieff *E News* \* May 30 \* Sep 19-**91**; *R & Eng* \* July -**91**; *The Eng* \* May 8-**91**

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**BHATGARH** *R & Eng* \* Aug -**92**

**BLACK Eagle Falls**, Great Falls, Mont., Parker, discuss., insets *Am CE* \* v 27 -**92**; *E Rec* \* Oct 8-**92**

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**BUTTE City** water-works, concrete masonry *E News* \* Dec 15, 22 -**92**

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- Dams, Coffer-dams and floating caissons**, R. Hunt *E & Min* \* July 19, 26-**90**
- CONEWAUGH, Johnstown, Pa. *The Eng* \* June 21-**89**, *E Rec*
- CROTON water-works, N. Y., Convent ave. gate-house *E News* \* Sep 1, 15-**88**; inset \* Nov 15, 15-**90**; inset \* June 2-**92**; Fteley report *E Rec* \* Oct 18-**90**. See also DAMS, Quaker bridge, Sodom
- CURVED vs. straight, Bell *E News* Mar 31; strains in, Church, cor. \* Dec 1, cor. \* 28-**88**; cor. Aug 16; masonry, strains in, Martin, cor. Sep 27-**90**
- DAVIS Is. movable, Ohio river, Pitts., Pa. *Sc Am Sup* \* Aug 1-**91**
- DENVER, Col., Citizen's water Co., large, n *E News* Sep 20-**90**. See also DAMS, Castlewood
- ENGLISH, Sierra Co., Cal., destroyed *E News* \* July 6-**89**
- FOLSOM, Am. river, Cal. *E News* \* Oct 17-**91**, *R & Eng* \* July -**92**
- HOLYOKE, Mass., Whiting st. *E News* \* Sep 6-**90**
- Kingston's floating scouring *Eng* \* Oct 26-**88**
- KIRK wooden *E News* \* Apr 28-**92**
- LAWRENCE, Merrimac river, Hale *E Rec* \* May 4-**89**, *J Assoc E Soc*
- LUMBER, Penn., inset *E News* \* Sep 5-**91**
- MOVABLE, Pochet's (full) *Sc Am Sup* \* May 24-**90**, *Genie Civil*. See also DAMS, Davis Is.
- MUSKINGUM river *E Rec* \* Mar 8-**90**
- NEW Brunswick water-works, a dubious, Hill, cor. *E News* \* June 16, proposed \* 23-**88**
- NILE barrage *E News* Sep 27-**90**
- NORTHFIELD, Vt., a very bold arch *E News* \* Sep 20-**90**
- PAWTUCKET water-works, R. I. *E News* \* June 1-**89**
- PECOS river, N. M., rock fill *E News* \* May 17-**90**. See also DAMS, reservoir
- PERIYAR, Madras *Eng* \* Nov 25, inset \* Dec 9, construction *E Rec* \* Dec 31-**92**
- POTOMAC river, Wash. water-works, constructing, Chittenden, inset *Am C E* \* v 18-**88**
- QUAKER bridge, Croton aqueduct. N. Y. water-works *E News* \* Feb 4, table, 11, design of, ed. 25, Marichal, cor. Mar 10; report and ed., inset \* Nov 3, 3-**88**; Fteley, Oct 11-**90**; map *E Rec* \* Oct 6; report *R Gaz* \* Oct 12, 26; Tratman *The Eng* Jan 27, Apr 20, Nov 30-**88**. See also DAMS, Croton

- Dams, Reservoir**, safety of, Kresnik *E & Min* \* Mar 1-**90**, *Inst CE*; rock fill, ed. *E News* July 28, Aug 11, and Schuyler, cor. Sep 22-**88**; and Conn. law, ed. Aug 24-**89**; European, Kresnik, Mar 15; Apr 12; measures for safety of, do. May 10; and embankments for water-works, inset \* June 21-**90**. See also RESERVOIRS; WATER-works
- Sodom**, Croton, N. Y. water-works, n *E News* \* Dec 1-**88**; Oct 25-**90**; *Sc Am Sup* \* Jan 5-**89**
- SOUTH Fork** reservoir failure, cause, com. report, discuss. (very full), insets *Am CE* \* v 24-**91**; *Eng* \* June 7-**89**; and Johnstown disaster *E News* \* June 15-**89**; com. report *E Rec* \* Aug 29 \* Sep 5-19-**91**
- SWEETWATER**, San Diego Bay, construction, Schuyler, discuss., insets *Am CE* \* v 19-**88**; and Bear Valley, do. *E News* \* Apr 7, F. Brown (Redlands, Cal.) \* June 23, Schuyler \* Oct 27-**88**; Nov 23, 30-**89**; Schuyler, abs. *Inst CE* v 97-**89**
- TANSA**, Bombay water-works, inset *Eng* \* Apr 29; *E News* \* June 30-**92**; *E Rec* \* Dec 19-**91**
- VYRNWY** lake masonry, Liverpool water-works *E News* Dec 29-**88**; and ed. \* Aug 18-**92**; *R & Eng* \* Jan -**89**, *Industries*; *The Eng* \* June 27-**90**
- WALNUT** Grove, Ariz., disaster *E & Min* \* Mar 1-**90**; *E News* Sep 22 \* Oct 20, Nov 3-**88**; \* Mar 8-**90**
- WATER-works**, of U. S., (list) *E News* June 15-**89**. See also RESERVOIRS; WATER-works
- WESTPHALIA**, Verse river, proposed, inset *The Eng* \* Feb 1, 8-**89**
- Daniel**, John, por. *E & Min* \* Feb 28-**91**
- Davenport**, Thomas, (inventor elec. motor), Pope, por. *El Eng* Jan 7; some cor. *El Wld* Apr 25; *St R J* \* Apr -**91**
- Davidson**, Robert, por. *El Wld* \* June 20-**91**
- Davy**, Humphrey *Eng* Jan 8-22, Feb 12-**92**
- Day**, David T., por. *E & Min* \* May 23-**91**
- Death**, Mitchell *Sc Am Sup* Oct 15-**92**, *Nat Sci*; origin of, Gardiner *Tech Q* July -**91**
- Dean**, John, por. *E & Min* \* Dec 20-**90**
- Debts**, county, of U. S., diagram *E News* \* Sep 6-**90**
- De Camp**, Edward F., por. *E & Min* \* Sep 12-**91**
- Decorticating** machinery *The Eng* \* Dec 27-**89**
- De Lamar**, J. R., por. *E & Min* \* Sep 5-**91**
- Delta** metal, *E News* July 26-**90**

- Denham**, Henry M. *Inst C E* v 91 -**88**
- Denny**, Robert *Inst C E* v 95 -**89**
- Denny**, William (ship builder) bk. n *Eng* Jan 25 -**89**
- Dentistry**, mechanics of, Sweet *Cassier's* Nov -**92**
- Deserts**, Am. Sahara, 'Valley of Death' *Locom* Jan -**91**; great, of the earth, James (full) *Sc Am Sup* June 22 -**89**
- Derricks**, hydr. and steam, Brown Bros. *Eng* \* Apr 18 -**90**; stresses in, Elliott \* July 10 -**91**; hydr. hoist, H. M. S. Vulcan \* Nov 18 -**92**; derrick plant for Equit. building, Denver, Col. *E News* \* Aug 22 -**91**; 15-ton. Butter Bros. *The Eng* Mar 2 -**88.** See also CRANES
- Devonshire**, Duke of (W. Cavendish) *Inst C E* v 107 -**92**
- Diamond** mining and industry, etc., polishing *Eng* \* Feb 8 -**89**; washing machinery \* Apr 25 -**90**; Kimberley stats., So. Africa, Sep 4 -**91**, report Dec 23 -**92**, do., Stonestreet *E Mag* \* Aug -**91**, do. *E & Min* Sep 19, discov., Thorburn, Oct 24 -**91**; Kimberley indus., Churchill, *Pop Sci* \* Aug -**92**; mines, Africa *Sc Am Sup* \* Aug 22 -**91**; the De Beers mine *The Eng* Aug 17 -**88.** See also GEMS
- Dibblee**, Frederick L. *Inst C E* v 97 -**89**
- Dick**, Charles *Inst C E* v 94 -**88**
- Dickinson**, George C. *Am C E* v 26 -**92**
- Dictionary.** See CENTURY dictionary
- Diet**, proper, for hot weather, Davies *Pop Sci* July -**92**
- Dikes**, Holland, notes, Starling, discuss., map, insets (very full) *Am C E* \* v 26 -**92**, do. *R Gaz* Nov 11 -**92**; compound (stone), most economical cross-section of, d'Auria *F Inst* \* June -**88.** See also CANALS; DAMS; RESERVOIRS; RIVERS, etc.
- Dirks**, Justus *Inst C E* v 92 -**88**
- Disasters**, in Aug., ed. *E News* Sep 8 -**88**; great, earthquakes, floods, etc., ed. July 6 -**89.** See also BRIDGE accidents; BOILER explosions; FLOODS; STEAMERS; RAILROADS, accidents, etc.
- Discoveries**, great, of past sixty years *Locom* Sep-Nov -**89**
- Disinfecting** ap., Koch, abs. *Inst C E* v 96 -**89**, \* *Bul Soc Mul* -**88**; *Sc Am Sup* \* June 30 -**88**, *The Eng*
- Disintegrator**, the devil *Eng* \* Aug 10 -**88**; trials *The Eng* \* June 27 -**90.** See also CRUSHING, GRINDING
- Disk**, hollow cast iron, strains in, Leverich *Am C E* \* v 18 -**88**
- Dividing** engine, 40,000 lines to the inch, Rowland *E News* Feb 18 -**88**

Diving boats *Eng* Mar 15, Apr 5-**89**; Stove's diving dress \* Mar 28-**90**

DIXON, John *Eng* Feb 6-**91**, *Inst C E* v 104 -**91**

DOCKS, Auckland, N. Z., calliope graving, Swainson *Inst C E* v 101 -**90**

BARRY, works, J. Robinson *Eng* Apr 11-**90**, hydr. machinery and mode of tipping coal, discuss., insets *Inst C E* \* v 101 -**90**

BOMBAY graving, proposed *Eng* \* May 18-**88**

BRISTOL *The Eng* \* Oct 14-**92**

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BROOKLYN Navy Yard dry-dock, Simpson *Eng* \* Aug 22, *R & Eng* June -**90**

CARDIFF schemes, Bute dock, map *The Eng* \* Dec 9-**92**

CHATHAM *The Eng* \* July 24-**91**

CUBA, crib for Signa Iron Co. *E News* \* Apr 9-**92**

DRY-docks, of world *R & Eng* Aug -**89**; Wivenhoe *The Eng* \* Feb 21-**90**. See also DOCKS, names of places

ESQUIMALT, Brit. Columbia, inset *Eng* \* July 20, inset \* 27-**88**

FLOATING, and pontoon, Taylor *Eng* \* Aug 10, do. *Sc Am Sup* \* July 7-**88**; offshore, Hamburg \* May 10-**89**, do. *The Eng* \* Mar 11-**92**; Limerick, steel gates, Hall *E Rec* Apr 10-**90**, do. *Inst C E* v 97 -**89**

GLASGOW harbor *Eng* \* Aug 9-**89**; the Cessnock *E News* June 2-**92**

GRAVING *Eng* Nov 18-**92**, *Inst C E*. See also DOCKS, names of places

HALIFAX, Nova Scotia, graving *The Eng* \* Feb 28-**90**

HAMBURG floating offshore *Eng* \* May 10-**89**, *The Eng* \* Mar 11-**92**

HAVRE port dry-dock *E Rec* \* Dec 3-**87**, \* *Genie Civil*; Bellot dock, Desprez, abs. *Inst C E* v 101 -**90**, *An Ponts* \* v 17-**89**

HULL, Alexandra, Hurtzig *Eng* Feb 10, discuss., inset *Inst C E* \* v 92 -**88**

INDIA, East & West, arbitration *Eng* Dec 28-**88**

LEAGUE Island dry-dock *E News* \* Mar 14-**91**

LIMERICK, floating, gates, Hall *E Rec* Apr 10-**90**, *Inst C E* v 97 -**89**; failure of walls and methods for reconstruction, Hall, inset \* 103-**91**

LIVERPOOL, port and Mersey river, dredging *Eng* \* May 30 \* June 6; Lyster, Jan 17, extensions, discuss., insets (very full) *Inst C E* \* v 100 -**90**; Mersey estate *Inst M E* July -**91**

**92 DOCKS, MARE ISLAND—DRAW-BRIDGES**

- Docks, MARE** Island, Cal., dry-dock *E Rec* \* Feb 13-**92**  
MARQUETTE, Mich., ore dock, Duluth, So. Shore & Atlan. R.  
*E & Min* \* Jan 10-24-**91**  
NEW York dock walls *E Rec* \* Sep 3, Oct 1-**92**  
PORTSMOUTH dockyard *Eng* July 29 \* Aug 5, 5, lifting ap., Cor-  
ner, 26-**92**  
PRESTON scheme, ed. *The Eng* June 29-**88**  
PUGET Sound, Wash., U. S. Naval station, inset *E News* May  
19-**92**  
SAN Francisco dry-dock. hydr., Union Iron works *R Gaz* \* Nov  
27-**91**  
SOUTHAMPTON tidal *Eng* \* Sep 12, inset *The Eng* \* July 25  
-**90**  
**Domestic** motive power by atmos. exhaustion, Dollfus, abs. *Inst  
CE* v 93-**88**, *Bul Soc Mul*-**88**; motors worked by rarefied  
air, Bourdenoot, abs. v 96-**89**, *Compt r* Feb 1-**89**  
**Dolivo-Dobrowolsky**, Michael Von, por. *El Wld* \* Mar 19-**92**  
**Dom** Pedro, ex-Emperor of Brazil *Inst CE* v 108-**92**  
**Douglass**, Archibald Bryce - *The Eng* Apr 10-**91**  
**Dovetails**, holding power of, Poe, report *E News* \* Dec 20-**90**  
**Downes**, Charles C. *Inst CE* v 92-**88**  
**Downing**, Samuel F. *Inst CE* v 109-**92**  
**Drainage**, tables, G. Johnson *E News* May 5, 12-**88**; blunders,  
Webster *E Rec* \* Dec 10, 24-**92**; hints, Chandler *Tech Q*  
Dec -**88**. See also **SEWERAGE**  
CHARLESTON, S. C., tidal *E News* Oct 25-**90**  
CHICAGO, drainage canal *E News* \* June 2, 30-**92**; *E Rec* May  
23-**91**  
FENS and lowlands, by gravitation and steam power, Wheeler,  
bk., Spon, Lond. -**88**  
HOUSE, domestic and water supply, Hartford *E Rec* \* Apr 2, 16-  
**92**; Chandler *Sc Am Sup* Jan 26-**89**, *Tech Q*  
LOUGH Erne, Price, discuss., inset (full) *Inst CE* \* v 101-**90**  
KANKAKEE marsh, Chic. canal *E News* \* Nov 3, 3-**92**  
MEXICO, Valley of, Chism, map *E & Min* \* Dec 8, 15, 22-**88**,  
map *E News* \* Aug 10-**89**; City of Mex., hist. sketch, Noll  
*E Rec* Mar 16-**89**; Val. *Sc Am Sup* \* Aug 10, map *The Eng*  
\* June 28-**89**  
WIESBADEN-Essen-Halle, abs. *Inst CE* v 96-**89**, *Deut Vier  
Ges*-**89**  
**Draw-bridges.** See **BRIDGES**, draw-bridges

**Drawing**, section lining, standard, Van Vleck *Am ME* \* v 9-**88**; Holman *Cassier's* \* Sep -**92**; drawing-board, vertical *Eng* \* Jan 13, do. Worth's *E News* Apr 7-**88**; section-liner and scale divider, Both's \* Oct 12-**89**; T square, Deane's adjustable \* Sep 13-**90**; essentials of mechanical drawing, Forney (very full) *R & Eng* \* Mar - \* Dec -**90** \* Jan - \* Dec -**91** \* Jan -**92**; as a means of education, Ablett *Sc Am Sup* July 7-**88**; simple method (artistic), Jacquot \* Mar 29-**90**. See also INSTRUMENTS, curve rule

**Dredge**, James, Wiley, por. *Cassier's* \* Feb -**92**

**Dredgers** and excavators, Panama canal, Williams, insets *Am CE* \* v 19-**88**; steam excavs., Clements *Am ME* v 9-**88**; Bennett elec. and amalgamator *El Rev* \* May 23-**91**

*Eng* double-ladder, Swansea harbor, inset \* July 13; frictional gear for, Griffith \* Aug 24; 'Kuphus' hopper, Bombay Port, inset \* Dec 7-**88**; hopper suction 'Libana,' Port of Libau, inset \* Jan 11; shore delivery for lake Copais \* Feb 1; dredging cost, Apr 26-**89**; sand pumping, Mersey bar, ed. Apr 11, and docks \* May 30 \* June 6; Cockburn crane and grab \* Oct 3-**90**; for excav. gold-bearing river beds \* Jan 9; steam crane excav., Weser river imp. works \* 16; dredging and amalgam. plant, inset \* Mar 27; Manchester canal soil transporter, inset \* July 24-**91**; floating elevator, transformation \* Aug 19; Jupiter twin screw suction pump \* Sep 30-**92**

*E News* Panama canal plant \* Aug 18, 25; French suction, Vernandon \* Nov 10-**88**; English, cost of, May 11; Lobnitz rock \* Jan 26, work of \* Oct 19-**89**; German stone \* Aug 16-**90**; Man. canal soil transporter, Sep 5-**91**; ap. for N. Y. harbor, Edwards, inset \* Mar 19; the Booth pump \* 26; trestle filling, N. Or. & N. E. R. \* Aug 4; dredging on Pac. coast, Miller, 4 \* 11-**92**; Lobnitz rock, removal under water without explosives *E Rec* \* Oct 12-**89**; four-screw hopper, Walker \* Feb 13-**92**, do. inset *Inst CE* \* v 107 -**92**; the von Schmidt, Higgins, inset \* v 104-**91**; hydr., N. Y. harbor *R Gaz* Aug 28-**91**; Jandin's hydro-pneu, jointed conduit *Sc Am Sup* \* Mar 9-**89**

*The Eng* dredging machinery, subaqueous rock, Suez canal, Mar 9; combined traction engine, crane and excav. 30; hopper, Glasgow exhib. Sep 7, 7-**88**; Wilson's single chain grab \* Nov 28-**90**; hopper, for New So. Wales, inset \* Apr 8; sand pump, Thyboron, inset \* Sep 16-**92**. See also under CANALS; HARBOR eng.

**Drexel** Institute, Phila., Depew *E Mag* Feb -92

**Drifting** tests, autographic, Goodman *Inst C E* \* v 92-88

**Drills** and drilling, electric mining *El Wld* \* Dec 12; Simplex twist-drill grinder *Eng* \* Nov 6-91; Ingersoll-Sergeant, air valve *E News* \* Sep 27-90; Ainly-Oakes square hole drilling machinery, inset \* June 20, inset \* 27; Edison elec. percussion, May 16-91 \* Aug 25; Schuttler contin. acting ratchet \* Oct 6-92; rock, trials, Carbutt, insets (full) *Inst M E* \* Mar; Hawkesworth stay-bolt *R Gaz* \* May 29-91; Edmeston grinding machinery *The Eng* Apr 27-88. See also ROCK drills

**Driven** wells. See WELLS

**Dry-docks.** See DOCKS, dry-docks, etc.

**Drying** ap. in vacuo, Passburg *Eng* \* June 28-89, insets *Inst M E* \* May -89, *Sc Am Sup* \* Apr 19-90

**Dublin**, port and works, Griffith, insets *Inst M E* \* July -88

**Duluth**, Minn., sts., pavements, sewers and drainage *E News* \* Feb 14-91

**Duncan**, Louis, por. *El Wld* \* Apr 5-90

**Duncan**, Robert *The Eng* July 12-89

**Duncan**, Thomas *Inst C E* v 110-92

**Du Port** (Bey), William J. *Inst C E* v 106-91

**Duodecimals**, Halliday *The Eng* Mar 1-89

**Dust**, (means of excluding) and fresh air, Teale *Pop Sci* June -92; number of particles in atmos., Aitken *Sc Am Sup* Apr 7-88; atmospheric, Marct, June 21-90; spectroscopic properties, Liveing \* Feb 14-91; McPherson, Jan 2-92; Prinz dust collector *The Eng* May 11-88

**Dye-houses**, ventilation of *Locom* Dec -88

**Dyes** and dyeing, a revolution in dyeing, Chase *F Inst* Nov, Dec -90; and photographic printing, diarotype proc., Carbutt, June -91; dyes, coal-tar or aniline *Chem Tr J*, *Sc Am Sup* May 9, fast and fugitive, Hummel (full) July 11, 18-91, Jan 30-92, *Soc Arts Lond*; lactic acid and lactates in textile coloring, Norton *Tech Q* Nov -90. See also CHEMISTRY; COLORS; INDIGO, etc.

**Dyewood** extracts, notes, Siebold *Sc Am Sup* Aug 17-89

**Dynamics**, a question of, Dewey, ed. *E News* \* June 23-88; dynamic possibilities, ed. Sep 15-92; practical illustrations of, Greenhill *The Eng* Sep 13, 27 \* Oct 25 \* Nov 8, 22, Dec 6, 20, 27-89, problems in, Jan 31, solution, Apr 4; nomenclature com., Brit. Assoc. pro. Aug 15, 22-90; of gravity, Preston, cor.

**Dynamics**

Apr 10-**91**. See also PHYSICS, Dynamics, bk., Fessenden, Lond. **-92**

**Dynamite** shells, ed. *Eng* Nov 16-**88**. See also EXPLOSIVES; GUNNERY and armor

**Dynamometers**, transmitting, loss in by friction, S. Webber *Am M E* \* v 10-**89**; aut. absorption, Alden \* v 11-**90**; belt dyn., Watt v 12-**91**; measurement of power, Gray, variable speed power transmission, Spaulding \* v 13, 13-**92**, *Iron Age* \* Dec 8-**92**

*Cassier's* power measurement, Gray \* June -**92**; Alteneck *El Eng* \* May -**88**; *El Rev Lond* \* Sep 23-**92**; the Trouvé *El Wld* \* July 19-**90**; Heinrich \* June 11-**92**

*Eng* friction brake, Beaumont, Nov 16-**88**, do. Brotherhood registering \* June 14-**89**; Amsler's recording \* Oct 24-**90**; a belt, Watt \* Sep 18-**91**

*E News* aut. absorption, Alden \* June 28-**90**; belt dyn., Watt \* June 20-**91**; measurement of power, Gray \* May 19-**92**; rough and ready, for small motors, Hoskin *F Inst* June **91**; friction brake, Beaumont, discuss. (full) *Inst C E* \* v 95-**89**; aut. registering *Sc Am Sup* \* Feb 9-**89**, \* *Industries*

*The Eng* Deprez registering, Feb 17; Smith's rotary transmission, May 11; friction brake, Newcastle engine trials, Anderson, Nov 9-**88**; Murray power transmission \* Nov 29-**89**

**Dynamos**, Dynamo-Machinery, S. P. Thompson, bk., Spon, Lond. '88

*El Eng* machines, theory, Hopkinson \* Jan, diseases, S. P. Thompson, Jan -**88**; shunt wound, influence of position of commutation on output of, Martin \* Dec 31-**90**; design, Reid \* Feb 4, 11-**91**; management, Crocker, Wheeler \* Jan 13, 20 \* Feb 3-17 \* Mar 9, 16, 30, Apr 27 \* May 11, 18; design, Loomis, Mar 16; machinery, theoret. elements, Kennelly \* Apr 20, 27 \* May 4, 18, 25, June 15, Nov 30, Hopkinson \* May 11; genesis, Pacinotti, por. \* Sep 21, 28 \* Oct 5, 12-**92**

*El Rev Lond* machines, synthetic study (full) \* Aug 3, 10, 24, Sep 7, 21 \* Oct 5, 19 \* Nov 2, 16, 23 \* Dec 7, 21-**88** \* Jan 11, 25, Feb 15 \* Mar 1, 15 \* Apr 5, 19 \* July 5, 19 \* Sep 6 \* Oct 4-**89** \* Jan 31 \* Feb 14 \* Apr 4, May 2, 16, June 6 \* July 11, Aug 22, Sep 26, Nov 7, Dec 26-**90**; Paris exhib. \* July 12, 26 \* Aug 2, 9, 23 \* Sep 6, 13 \* Oct 11-**89**; machines, Minet, Feb 7, 14; and motor design, Esson \* 28 \* Mar 7, 14-**90**; Blackburn

**DYNAMOS**

\* Jan 30 \* Feb 6; choice of a dynamo, considerations, Roberts, Oct 30, Nov 6; Frankfort exhib. \* Oct \* Nov \* Dec -91; machinery, Hopkinson \* Apr 15; waste field of, expts., Puffer \* 15; relative weights and costs, Snell \* May 20; cals. and designing chart, do. \* June 3-92

*El Rev* Knowles \* July 20-89; machines and motors imps., Swinburne \* Apr 19; control of and coupling, do. Sep 6, 13-90, *Industries*

*El Wld* and motors, cal. and designing, Crocker \* Apr 28; machines construction, Poole, June 30; and motors designing, Owens \* Nov 17-88; machines, Hillairet, Sep 7-89; and motor design, Esson (full) \* Mar 22, 29 \* Apr 5, 12; best speed, Rechniewski \* Sep 13, new forms, Wadsworth \* 13-90; choice of a dynamo, Roberts, Oct 17-91; and motors, magnetic leakage, Ives (full) \* Jan 2; effic. determinations, Kapp \* Feb 20; dynamo-elec. machinery, Hopkinson, Wilson \* Apr 30; relative costs and wts., Hering \* 30; and motor cal., Bedell, diag. \* 30; heat radiation from, Rechniewski, May 14; relative wts. and cost, Snell \* June 25; effic. diag., Hering \* Aug 13; designing, Picou, Nov 5-92

*Eng* Paris exhib. \* Sep 6; Desrosier, do. \* Oct 18-89; early \* July 10-91; and motor cal., Bedell, inset *F Inst* \* June -92; 1000 h.p. steam, Berlin Cen. elec. light station, Uppenborn, abs. *Inst C E* v 100-90, *Elek Zeit* v 5 -90; Cail Soc. abs. *Inst C E* v 106-91, \* *Genie Civil* v 19 -91; designing, Hobart *Pwr* \* Oct \* Nov -89 \* Feb - \* Apr \* June - \* Sep -90 \* Feb, Mar -91; development, Fairchild \* Apr \* May -90; losses in, Hobart \* May -91; diseases of, S. P. Thompson *Sc Am Sup* Jan 7-88; waste field of, experimental study, Puffer *Tech Q* \* Oct -91; speculations on electro-magnetism, Fritsche *The Eng* \* June 21; Alioth, Paris exhib. July 12-89. See also ELECTRIC generators — motors

ACCESSORIES, dynamo room, for resist. measurements, etc., Haskins *El Rev Loud* \* Sep 6 *El Rev* \* Aug 17 *El Wld* \* 17-89

ADMIRALTY specifications *El Rev* May 3-90

AIR gap, relation of, and shape of poles to performance of, Ryan *El Eng* \* Sep 30 \* Oct 7, (full) *El Rev* \* Oct 3, (full) *El Wld* \* Oct 3-91

ALTERNATING current, arc, analyzing magnetic reactions of armatures, Reid *El Eng* \* Nov 5; Stanley arc, Tobey \* Nov 5, do.

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investigation (full) *El Rev* \* Nov 8, do. *El Wld* \* Nov 8-**90**; Kennedy *El Rev Lond* \* June 1-15, 29-**88**; \* May 17-**89**; curves showing performance, Lewis *El Wld* \* Nov 14-**91**; machinery, Kapp *Eng* Feb 22, May 31-**89**, do. and discuss. (full) *Inst C E* \* v 97-**89**; generators and receivers, Anthony *Soc Arts Mass* -**88**

AMPERE-foot table for cal., and motor windings, Serrell *El Eng* Dec 10-**90**

ARC, open coil, M. E. Thompson *El Eng* \* May 27, (full) *El Rev Lond* \* June 19, *El Rev* \* June 6, discuss. 13, *El Wld* \* May 30-**91**. See also DYNAMOS, alt. current

ARMATURE reactions and motors, theory, Swinburne *El Rev Lond* \* Feb 14, 21, discuss. Mar 28, Apr 4, *El Rev* \* Mar 15-**90**; ring, relative proportions of, Dobbie *El Wld* \* Jan 26; methods to determine equiv. area of, Ferry, Aug 31-**89**; reaction in constant current, Carthart (full) \* June 6; reactions, Wagner \* Aug 22-**91**, *Technic*

BALL, manuf., Collins *El Eng* \* Nov 30-**92**

BROWN'S, transmiss. of power by *Eng* \* Apr 20-**88**

BRUSH alt. current system *El Eng* \* Aug, *El Rev* \* July 13; arc, effic. etc., Melbourne exhib. lighting, Murray *El Rev Lond* Nov 15-29-**89**

COMPOUND winding, theory of for constant poten., Bell *El Eng* Nov 26, *El Rev* \* Nov 29-**90**; patents (full) *El Rev Lond* Nov 30, Dec 7-28-**88**, Mar 1-15, May 31, June 7, 14, July 5-**89**, machines, July 25-**90**

CONTINUOUS current machines design, Jamieson (full) *El Rev Lond* \* Mar 8-**89**, *Inst C E*

DESROZIER'S disk-dynamo, Meylan, abs. *Inst C E* v 95-**89**, *Lum Elec* v 29-**88**

EVANS friction cone direct driving system (theory) *El Eng* \* Mar 25-**91**; *El Rev* \* Sep 14, belt *El Wld* \* Sep 14-**89**

EDISON, and motor *El Rev Lond* \* Aug 21-**91**; *Sc Am Sup* \* Mar 5-**92**; Paris exhib. *The Eng* \* Nov 15-**89**

EICKEMEYER'S *El Eng* \* Mar -**88**

FERRANTI system, Haskins *El Rev* Feb 28-**91**; 10,000- light, Grosvenor gallery, Lond. *Sc Am Sup* \* Dec 15-**88**; *The Eng* \* Nov 1-**89**

FIELD-magnet coils for, Kapp *El Wld* May 3-**90**

FRITSCHE wheel *El Rev* \* Apr 6, n *Sc Am Sup* \* Apr 20-**89**

- DYNAMOS**, GANZ contin. current, Delta type *El Rev Lond* \* Dec 14-**88**; alt. machine and transformer, Forbes *El Wld*\* May 25 -**89**
- GOOLDEN-Willans combination, tests *El Wld*\* Dec 6-**90**, *Electrician Lond*
- HOCHHAUSEN arc light machine *El Eng* \* Apr 23-**90**
- LEAKAGE, magnetic, and motors, Ives *El Rev Lond* \* Jan 22, 29 -**92**, *El Wld*
- LEEDS, the *The Eng* May 25-**88**
- MORDEY alt. current *Eng* \* June 1-**88**
- MULTIPOLAR, low speed, for contin. currents, Perret *El Eng* \* Nov 26, do. *El Rev* \* Nov 29, do. *El Wld* \* Nov 29; Riker low speed contin. current, and motors \* Dec 17-**90**; at Frankfort exhib., Kolben \* Nov 25 \* Dec 2; design, Esson \* May 6, 20, do. *El Rev Lond* \* Apr 10, 24, May 1, do. *El Rev* \* May 16, do. *El Wld* \* May 2, 9, 23-**91**; *Pwr* \* Dec -**92**
- OERLIKON three phase alt. current *El Rev Lond* \* Aug 28-**91**
- PERRET, and motors, building (full) *El Eng* \* Jan 6-**92**; and motor *El Wld* \* Feb 2, July 6 \* Aug 3-**89**. See also DYNAMOS, multipolar
- PLATING, Hopkin's *Sc Am Sup* \* Mar 14-**91**
- PYKE & Harris alt. current *El Rev Lond* \* May 6, 13-**92**
- PYLE aut. steam engine and (multiple cyl.) n *El Wld* \* Aug 29 -**91**
- REGULATION, arc or constant current, Tischendorfer *El Eng* \* July 1-**91**; by means of a third brush, Caldwell (full) \* Dec -**88**, (full) *El Rev Lond* Jan 4-**89**; alt. current regulating, Lowrie \* Sep 28-**88**; current reg. decision, T. H. vs. Citizen's Elec. L. Co. *El Wld* Sep 1-**88**; Lahmeyer's system, Paget \* Oct 12-**89**; reg. of constant current, Dow \* Apr 11-**91**
- RING, the, Paris exhib. *The Eng* \* Aug 9-**89**
- SAUTTER-Lemonnier's duplex *The Eng* \* Oct 25-**89**
- SCIENTIFIC American, the *El Rev Lond* \* Aug 5, *Sc Am Sup* \* July 30-**92**
- SERIES, loss in armature of, Opitz *El Eng* \* Aug -**89**
- SPARKING and flashing of, M'Berty (full) *El Rev* \* May 28-**92**. See also ELECTRIC sparking
- STEINLEN, the *The Eng* \* Oct 18-**89**
- STURGEON's early *El Wld* \* Aug 1-**91**
- TESLA unipolar *El Eng* \* Sep 2-**91**
- THOMSON's *El Rev Lond* \* Aug 15-**90**; and lighting ap. manuf.,

**Dynamos**

Thomson-Houston works, Lynn, Mass. *E News* \* June 30, July 7, 14-**88**

THURY, the *The Eng* July 19-**89**

WADDELL-Entz, and motors *El Eng* \* Dec 30-**91**

WESTINGHOUSE, expt. determination of law of variation of elec. mo. force in armature, Searing *El Rev Lond* \* Aug 30, do. *F Inst* \* Aug; *Eng* \* Jan 18-**89**

WESTMINSTER, the *El Wld* \* May 18-**89**

WILLSON's 1000 h.p. *El Rev* \* July 4 (large) electroplating *El Wld* \* July 4-**91**

WIRES sizes, table *El Rev Lond* Nov 16-**88**

**Dyson, George** *Inst C E* v 106 -**91****Eagles, Thomas H.** *Inst C E* v 110 -**92**

**Earth**, polarization of the, by heavy currents, Cuttriss *El Eng* \* Sep 3-**90**; elec. conductivity, Appleyard *El Rev Lond* \* Mar 11-**92**; Seismograph (instrument), Gray-Milne *El Rev* \* Jan 21-**88**; elec. disturbances from elec. lighting, Preece \* Apr 27 -**89**

*Eng* model of, Paris exhib. June 28, do. *E News* July 13-**89**; earth's crust, percentage composition of, F. Clark, June 28-**90**; handling earth, unloading from cars \* Apr 18-**91** \* Oct 6-**92**

*F Inst* how measured, Gore, Nov, Dec -**92**; influence of rotation on moving bodies (railroad train), Bavier, abs. *Inst C E* v 99 -**90**, *Zeit deut Ing* -**89**; how long can the earth sustain life, Littell's, June 11-**92**; measuring the earth *Locom* May -**89**; theories, Feb -**90**; population, Feb, *Pop Sci* Jan -**92**

*Sc Am Sup* earth, as seen from the heavens, Aug 18-**88**; age of, d'Assier, Mar 2-**89**; not a vast cemetery, Prime (cals.) Jan 18-**90**; earth removal by scrapers \* Apr 11-**91**, *Zeit Arch Hannover*; theory of, Geikie *Sc Am Sup* Sep 17, 24; age of, Hutchinson, Oct 15-**92**, *Knowledge*, d' Assier *Rev Sci*

**Earthenwares**, porous, Gilman (full) *Sc Am Sup* May 30-**91**. See also STONEWARE.

**Earthquakes**, and magnetic phenomena, Milne *El Wld* \* Oct 11-**90**; Japan *Eng*\* Jan \* Feb 5-**92**; theory of, Falb *E News* July 14, 21-**88**. See also BUILDING, earthquake countries

**Earthwork**, estimating overhaul in, by means of the profile of quantities, Fisher *E News* \* Jan 31; cal. overhaul for, Stanford, cor., comput. areas from cross-section notes \* Apr 18, 18-

**Earthwork**

**91**; retaining walls design, K. Allen *E Rec* \* Oct 29 \* Nov 5-**92**; cals., Hurst's triangular prismatic formula, J. W. Smith *Inst C E* \* v 95 -**89**. See also DAMS; FOUNDATIONS; HARBOR eng; RESERVOIRS; TUNNELING; WATER-works

**Easten**, James *Inst C E* v 95 -**89**

**Edison**, Thomas A., inventions at Paris exhib., Hammer *El Wld* \* Aug 31 \* Sep 7-28 \* Oct 5, 12 \* Nov 16-**89**; life and inventions, Dickson, por. *Cassier's* \* Nov \* Dec -**92**; por. *E & Min* \* Oct 10-**91**; por. *Sc Am Sup* \* Apr 19-**90**

**Education**, mechan., plea for the printing press in, Hawkins *Am M E* v 8 -**88**; technical, Eggleston, Pres. addr. *Am Min* v 16-**88**; technical elec., Owens *El Rev* July 9, electro-technical do. *El Wld* June 18, Jackson, 18, discuss. 25-**92**; technical, ed. *Eng* Jan 24-**90**; eng. schools *E News* files, July- Dec, etc. -**92**; value, and drawing and hand work in pub. schools Canbes *F Inst* Sep -**89**; nat. hist. in elementary schools, Hensoldt, Jan -**90**; of the future, C. King *Forum* Mar -**92**; eng. education in Brit. Dominions (bk.) *Inst C E* -**91**; of the steam engineer (list of studies) *Pwr* Jan -**91**; manual, or industrial training, Taube *Pop Sci* July -**88**; scientific method in, W. Mills \* Nov -**92**; technical, Armstrong *R & Eng* Sep -**88**, 19th Cent.; industrial, Pratt Inst., Brooklyn *Sci Am* Oct 6-**88**; technical, Galbraith *Sc Am Sup* Apr 23; the new, Thurston, July 30-**92**; Atkinson *Tech Q* May -**90**; scientific and technical schools, place of in Am. education, Walker, Dec -**91**; technical, R. H. Smith *The Eng* Feb 12, 19, Mar 11-**92**. See also MANUAL training; SCHOOLS

**Egypt**, the redemption of *E & Min* Apr 11-**91**; land reclamation in *E News* May 12-**88**; and Greece, ed. notes, Aug 23, 30 -**90**; Egyptian monuments, how read, *Littell's* May 14-**92**. See also IRRIG. in Egypt

**Eickemayer**, Rudolf, por. *El Eng* \* Dec 17-**90**, por. *El Rev* \* July 9-**92**

**Eiffel**, Gustavo, por. *Sc Am Sup* \* June 15-**89**

**Ejector** and its work, Hiscox *E Rec* \* Nov 19-**92**. See also INJECTOR

**Elder**, John, statue *Eng* \* July 27, do. *Sc Am Sup* \* Sep 1-**88**

**Electrical** arcadia, Johnson *El Wld* Mar 28-**91**; future development, E. Thomson *N E Mag* July -**92**. See also under ELECTRIC eng.

**Electric** engineering, mod. theories, review, Anthony *El Eng* Feb -90; elec. science, see Brit. Assoc. pro. *El Rev Lond* Sep -88; industries prog. Jan 2, 9, 23, 30; science, Crookes' addr. (full) \* Jan 16, 23, Varley, 23, Feb 6; prog. July 3, 10-91

*El Rev* development, Preece, Brit. Assoc. Oct 13-88; prog., '88 \* Jan 5-89, Feb 20, '92, Dec 31-92; possibilities, Madden, June 15-89; theories review, Anthony, Feb 1-90; mod. uses, Parker \* Jan 31, Weyde \* Feb 21-91

*El Wld* prog., '87, Wetzler, Jan 14-88, (review of half year) June 28, of '90, review, pors. \* Dec 27-90, of '91, Dec 26-91, do. Houston, June 11, needs of the times, Watts, Dec 3, 17-92; trans-atlantic trip notes, Lockwood (full) Oct 26-89; theories review, Anthony, Feb 1, discuss. \*8; improvements, prodigality in economy, Haskins, Mar 15-90; European practice, Hering (full) \* Sep 19, 26 \* Oct 3, 24-91

*Eng* plant, Paris exhib., Oerlikon, July 26-89; possibilities of, W. Crookes (suggestive) *Littell's* Apr 9-92, *Fortnightly Rev*; discovery, the latest, Tesla, Gordon *Littell's* Apr 30-92, 19th Cent.; future development, E. Thomson *NE Mag* July -92; prog. in '88 *Sci Am* Feb 9-89; eng. in Am., Addenbrooke *Sc Am Sup* Feb 15-90; possibilities, Crookes, Mar 12 -92; eng., Paris exhib. *The Eng* \* Aug 9, 16 \* Oct 4-18 \* Nov 1, 15, 22; eng. in U. S., Addenbrooke, Dec 20-89. See also ELECTRICITY; ELECTRO -

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ACTION, theories review, Carhart *El Eng* Sep, *El Rev Lond* Sep 27, *F Inst* Nov, *Sc Am Sup* Oct 12-89; due to an intervening medium, Fitzgerald, Oct 6-88

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- ARC, photographic study of, Nichols *El Eng* \* May 27, *El Wld* \* May 30, E. Thomson, discuss. June 6, *El Rev* \* June 6, discuss. 13, alternating between a ball and point, expts. do. \* Jan 17, do. *El Rev Lond* \* Feb 6-**91**; light of, Trotter \* May 6, 13, discuss. 20; alt. currents expts., E. Wilson \* Dec 30-**92**; and use in lighting, E. Thomson (full) *El Rev* \* Feb 28-**91**; normal and hissing arcs, Cravath *El Wld* \* Mar 19-**92**; arc resistance and dynamo armature, Feussner, abs. *Inst C E* v 92-**88**, *Central Elek* -**88**. See also ELEC. lamps, arc
- BALANCE, W. Thomson's composite, Gray *Sc Am Sup* \* July 14-**88**, *Industries*
- BATTERIES, Paris exhib., Hering *El Eng* \* May 21 \* June 26-**90**; econ. in primary employed for generating power, Kennelly (full) Mar 30-**92**, do. *El Rev Lond* May 6-**92**; elec. mo. force of, Chronstchoff, Sitnikoff, June 28-**89**, *Compt r*; chem. generators, possibilities and limitations of, Crocker (full) *El Eng* June, *El Rev Lond* June 8, *El Wld* May 26; primary tests, Kennelly \* Sep 1-**88**; standard cell, Hering *F Inst* \* May -**91**; high power, Sprague, *Sc Am Sup* June 13-**91**. See also STORAGE batteries
- BICHROMATE, elec. mo. force of, Reynier, abs. *Inst C E* v 92, 92-**88**, *L'Electrician* -**87**-**88**; for domestic elec. lighting *Sc Am Sup* \* Mar 23-**89**, *Genie Civil*
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- GALVANIC, notes, Land *El Wld* Mar 15, 22-**90**; practical value of, expts., Sosnovsky, abs. *Inst C E* v 98-**89**, *Jurn Min Soob* -**89**
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- FIXTURES**, exterior *El Wld* \* Dec 5, 12-**91**; decorative, Wall *E Mag* \* Oct -**91**
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- FURNACES**, early forms, Pepy's, Houston *F Inst* Jan, Depretz's, Lontin's, Feb. Johnson's, Watson & Prosser's, Apr \* June, Werdermann's, July -**88**, do. *El Rev Lond* Apr 6, 27, June 1 \* Aug 24-**88**; first \* Aug 5-**92**; Edison's *Sc Am Sup* \* Oct 31-**91**
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ROPE gear for elec. light work, Booth, Lea *El Rev Lond* June 26-**91**

RULES. See ELECTRIC lighting regulations

SAFETY devices E. Thomson *El Eng* Mar, *El Wld* Feb 22-**90**; station safety regs. *El Rev Lond* Jan 11-**89**. See also ELEC. lighting regs.

ST. Brieux *El Wld* \* May 16-**91**, *El Rev Lond*

ST. Catherine's Point light-house, most powerful light in world  
*Sc Am Sup* \* July 21-**88**, *The Eng*

ST. Louis 'Munic.' arc system and station (largest in world) *El Rev Lond* Jan 16, report (full) *El Wld* Jan 3, Ayer (full) Sep 19-**91**

ST. Paul Gas Co. station *El Wld* \* Feb 23-**89**

SALEM, Mass., T-H station *El Rev* \* June 15, (plans) *El Wld* \* June 15-**89** \* Mar 15-**90** \* Feb 14-**91**

SOPHIA City *El Rev Lond* June 17-**92**

SPERRY system *El Wld* \* June 15-**89**

SPOKANE Falls station *El Wld* \* Sep 13-**90**

STATIONS *Am CE* Edison incand., test of, Hill, and discuss. v 18-**88**; *Cassier's* speed reg. of engines, Aldrich, May -**92**  
*El Eng* incand., independent engines for, Church, Mar -**88**; stats., U. S. Aug 20; value of detail in, DeCamp \* 27-**90**; distrib. of steam from, Prentiss \* Feb 25: central, management and finance. Foster, Apr 22, 29, May 6-20, June 3-24, July; op. by water power, Redman, Sep 16-**91**; fly-wheel accidents, Emery, Feb 10, 17; effic. and higher econ., Vail, Nov 23, 30, Dec 7; light and railroad plants op. from same station, M Cay, Dec 28-**92**

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*El Rev Lond* independent engines for, Church \* Apr 13; transformers vs. accums., Crompton \* Apr 20, 27, May 4; breakdowns, R. J. Jones \* June 22; cost, Fritsche \* Aug 31-**88**; cen., notes, Yeaman, Nov 21-**90**; materials \* Mar 13; combining contin. and alt. cur. systems, Leonard, Oct 2, 9; how to get paying loads for, Marks, Dec 4-**91**

*El Rev* construction, Woodbury \* Feb 22; econom. steam gen., Babcock, Mar 1; accounts system, T. C. Smith, Mar 1; insurance, Barton, May 31, July 19-**90**; building, Berlin Iron Bridge Co. \* Jan 10; steam distrib. from, Prentiss, Feb 28; accounts, uniformity in method, Burleigh, sup. Sep 19; cen. op. by water power, Redman, 19: how to get paying loads for, Marks, Nov 21-**91**; and power, Mackie, July 23, 30, Aug 13, 20, Sep 10-24, Oct 8, Nov 5, 12-**92**

*El Wld* accounts, T. C. Smith, Feb 22: Woodbury \* 22; value of details in, DeCamp, Aug 30; as an investment. Sunny, Oct 25-**90**; steam distrib. from, Prentiss \* Feb 28; uniformity in accounts, Burleigh, Sep 19; op. by water power, Redman, 19; how to get paying loads for, Marks, Nov 21-**91**; the lamp, manager and customer, Roberts \* Mar 19: load curves \* Feb 27-**92**, \* *Electrician Lond*

*E News* Keswick, England, water power, inset \* Sep 13-**90**; op. by water power *E Rec* Oct 10-**91**; running *Pwr* \* Sep - Dec -**90** \* Jan - Mar \* Sep \* Nov -**91**; hazards, Low Sc Am Sup Apr 9-**92**; stats. *St R J* Sep -**90**; Soc. L'Eclairage Elec., France *The Eng* \* Nov 1-**89**; U. S., Addenbrooke, Jan 10, 24, 31-**90**; arc station management, June 24-**92**. See also ELEC. lighting, names of places

SUEZ canal, Sellon *El Rev Lond* \* Sep 14-**88**

TAMWORTH, New So. Wales, Dymond *Inst C E* \* v 108 -**92**

TESLA's system with curs. of high frequency *El Rev Lond* \* July 17, *El Rev* \* July 4-**91**

TIVOLI station *El Rev Lond* \* July 15-**92**

TOPEKA, Kan., Kingman, discuss. *Am C E* v 26 -**92**

VENICE station *Eng* \* Aug 14-**91**

WASHINGTON, U. S. Navy Yard, Brush arc station, Wilkes *El Eng* \* May 21-**90**

WESTINGHOUSE alt. arc system *El Eng* \* Apr 2-**90**; (full)

*El Rev* and sup. \* Oct 27, alt. stations (list) Nov 10-**88**; *Eng* \* Feb 8, 22 \* Mar 15-**89**; abs. *Inst C E* v 101 -**90**

- Electric Lighting**, Westminster Elec. Light Co. station *El Rev Lond*\* Mar 18-**92**
- WIRING leads cal., graphic method, Hering *El Eng*\* May 27-**91**. See also ELEC. wires
- WORCESTER, Mass. station, Shaw *El Eng*\* Dec 10-**90**
- LOAD equalizer, Mailloux *El Rev Lond*\* Dec 26-**90**
- LOCK, electro-mag. permutation, Sedgwick's *El Rev*\* Sep 28-**89**
- LOCOMOTION, Edison pat. *El Rev*\* Oct 4-**90**
- LOCOMOTIVES, Dobbie's gearless *El Eng*\* June 10; Eickemeyer's gearless *El Rev*\* June 13-**91**; proposed, Pellissier *El Wld*\* Aug 6; tests, Siemens \* 27-**92**; ed. *The Eng* June 13-**90**
- LOG *El Rev Lond*\* Jan 30-**91**
- MACHINES, Wimhurst influence, Darke, cor. *Eng*\* Feb 14-**90**, theory, Pellissier *Sc Am Sup*\* Nov 14-**91**. See also ELEC. influence machine; DYNAMOS; ELEC. motors
- MAGNETIC susceptibilities of various iron and steel, Niegbaur *El Eng*\* Feb -**90**; reluctance, Kennelly (full)\* Nov 4-**91**; propagation, E. Thomson, Wightmann *El Rev Lond*\* Oct 26, do. *El Wld*\* Oct 27-**88**; screening, variational, W. Thomson \* May 9, do. *El Rev Lond* May 1-**91**; leakage, Ives \* Jan 22, 29; balance, Du.Bois \* Sep 2, do. *El Wld*\* Sep 24-**92**; non-magnetic balances and alloys, Haswell, Webb *El Rev* June 23-**88**; field, change of form affecting, Dolbear, Mar 21-**91**; permeabilities of irons, Thompson \* July 2-**92**; call and integrator, the Abdank *El Wld*\* Nov 24-**88**; Eickemeyer's gauge \* Nov 9-**89**; mag. circuit notes, Steinmetz, June 4; permeabil. of special irons, M. E. Thompson \* 25; viscosity expts., Hopkinson \* Oct 1-**92**; field, early conception, Houston *F Inst* Mar -**92**; circuit, theory, Collins *Tech Q*\* May -**89**
- MAGNETO-motive force and mag. formulas, Emery (full) *El Rev*\* Aug 27 \* Sep 3-**92**
- MAGNETS, permanent, character of steel used for, Preece (full) *El Rev Lond*\* Sep 12-**90**
- MAGNETISM, relation to induced elec. mo. force and cur., E. Thomson (full) *El Wld*\* June 1, *El Eng*\* June -**89**; Hopkinson \* Apr 9-30-**90**; twisting, Balch \* Sep 14-**92**; in watches, Giles *El Rev Lond*\* Oct 26, Gribi *El Rev* June 9, (full) *El Wld*\* June 30-**88**; induced, Ewing \* Oct 4, 11, *El Rev Lond*\* Oct 3-**90**. See also MAGNETISM

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**Electric Magnetization**, permeabil. of iron at right angles to direction of, Kennelly *El Eng* \* June 11, 18-**90**; curves for, Emery \* Dec 28-**92**; of iron, time-lag in, Ewing (full) *El Rev Lond* \* Nov 8-**89**; changes produced by, in length of iron wires, Bidwell, Oct 14; of iron, electro-chem. effects, Andrews \* Nov 25-**92**; formulas, Emery (full) *El Rev* \* Aug 27 \* Sep 3-**92**; of iron in very strong fields, Ewing *El Wld* Dec 22-**88**; curves of iron, under alt. curs., Moore \* June 4-**92**; theory and formula for soft iron, Collins *Tech Q* \* May -**89**

**MEASUREMENTS**, W. Thomson's instrums., Fleming *El Wld* \* Feb 25, *El Eng* \* May -**88**, by Weston high resist. voltmeter, Loomis \* Dec 24-**90**, *El Rev Lond* \* Jan 9-**91**; measuring ap. standardizing, Berlin, Aug 9-**89**; Anthony *El Rev* Jan 21; methods, Liebig, sup. Sep 8-**88**; wiping contact methods for cur. and poten., Thomas \* July 30, *El Wld* \* July 2-**92**; voltametric of alt. curs., Kennelly \* Nov 3; in a house to house supply, Lowrie \* 17-**88**; units and measures, Internat. conference, Paris (full) Sep 21-**89**; applics. of Weston voltmeters and ammeters, Maschke (full) \* Mar 26 \* Apr 2-23-**92**; Lowrie *Eng* Oct 5-**88**; Webb *E Mag* Oct; instrums., Swinburne *E News* Sep 15-29, (full) *Inst C E* \* v 110-**92**, *The Eng* \* May 6-**92**; as applied to commercial work, Anthony *F Inst* Jan -**88**; constant shunt method for large contin. curs., Pike \* June -**92**; resist., Bauer *Pwr* \* Mar -**92**

**METERS** *El Eng* Shallenberger's \* Sep -**88**; Edison chem., Jenks (very full) \* Jan -**89**; the Walker \* Apr 9; Wood's \* Dec 17-**90**; the Meylan-Rechniewski energy \* Mar 18, Eicke-meyer's differential magnetometer, Steinmetz \* 25; alt. cur. potentiometer, Moler \* May 27-**91**; Pilkington-White \* Apr 13 -**92**

*El Rev Lond* Geyer-Bristol, for direct and alt. curs. \* Dec 21, 28-**88**; Edison chem., Jenks, Jan 11 \* 25, Feb 1, 8; for central stations, Forbes, Feb 1, 8; Cardew recording \* Nov 15-**89**; com. report, Mar 28; Blathy alt. cur. \* June 20; Thomson's \* Aug 15; W. Thomson's \* Oct 10; Mares' energy \* Nov 7; Shand, Dec 5-**90**; Meylan-Rich. energy \* Feb 13; Ferranti's \* Mar 20; Frere's \* 20-**91**; Brillie energy \* Apr 29; Scott's \* Dec 16, *The Eng* \* Dec 16-**92**

*El Rev* for central stations, Forbes, Feb 16; the Slattery \* Oct 12-**89**; Edison electrolytic, Kennelly \* Oct 4-**90**; Walker, May 30, discuss. June 13-**91**

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*El Wld* Shallenberger's alt. cur. \* Sep 15; Geyer-Bristol, for direct and alt. curs. \* Nov 24; Reckenzaun & Pentz's \* Dec 29-**88**; Edison chem., Jenks (full) \* Jan 5; Nipkow's alt. cur. ammeter \* Mar 9; E. Thomson's oscillating \* May 4; the Walker \* July 20; the Manwaren \* Dec 7-**89**; the Walker \* Apr 12, May 30, discuss. June 13; Shand, Nov 22-**90**; Perry's elec. supply \* July 11-**91**

*Inst C E* for recording consumpt. of elec. energy, Wordingham, insets (full) \* v 108-**92**; Mares' energy, Juppout, abs. v 103-**91**. *Genie Civil* \* 17-**90**; Hobart *Pwr* \* June-Sep -**89**; the Wood ammeter *Sc Am Sup* \* Jan 14-**88**; radiation meter, Gregory \* Dec 14-**89**; \* Jan 25-**90**; the Frager *The Eng* \* May 29; the Teague \* June 19-**91**. See also ELEC. ammeters—ohm — secoh — tele — volt — watt meters

MINING machinery, Atkinson *Eng* Feb 13, *E News* \* Aug 8; energy transmiss., Leonard and ed. \* May 16, Edison elec. percussion drill, 16; Aspen Min. & Smelting Co. \* Oct 10-**91**

MOLDINGS, standard for elec. work *El Rev* \* Nov 15-**90**

MOTIVE force, thermo-chem. relation to, Siebel *El Eng* July 9-**90**, relations to atomic wt., chem. heat, etc., Gore, *El Rev Lond* June 12-**91**, general relation to equiv. vol., Gore, June 3-24-**92**, constant with variable speed, Hoho *El Wld* \* Jan 25-**90**, equation, for resist. and self-induc. circuit, Bedell (full) May 14-28, June 4-**92**; properties of the human heart, Waller \* Nov 3, *Sc Am Sup* \* Nov 24-**88**, *El Rev*; power, Thorenberg plant *Sci Am* Dec 1-**88**

MOTORS, *Am C E* comparative tests and st. locom., Manhattan eleva. R., Moss, and discuss., insets \* v 23 -**90**

*El Eng* alt. cur., Duncan (full) \* Mar, Mar; Liebig, Mar; designing, Walker, May; 2 h.p. Sprague, expts.. Cox \* June \* Aug; alt. cur. and transformers, new system, Tesla (full) \* June, June, Swinburne, Sep; service charges basis, Lufkin, Sep -**88**

*El Eng* diags., Clarke \* Jan; regulation, Crocker \* June; and dynamos, Perret \* Aug; speed regulation, Deprez on, Paget \* Aug; alt. cur. evolution, Patten \* Oct -**89**

*El Eng* Swinburne's alt. cur. \* Apr 16; Tesla's alt. \* Aug 6; rates basis, Lufkin \* 27; Tesla's new alt. Sep. 24; building, Short elec R. system \* Oct 15; Bradley's alt. \* Nov. 5, self-exciting \* 12; windings, Serrell, Dec 10; Riker low speed multipolar contin. cur. \* 17-**90**

**Electric Motors**

*El Eng* inventors of (Thomas Davenport) Pope (full) \* Jan 7-28 \* Feb 4; Patten's alt. \* Mar 4 \* May 13; alt. cur. design, Weston \* Apr 1; perfection of stationary, Crocker \* May 27; alt. cur., Hospitalier, Aug 26; op. at any speed or torque, with max effic., Leonard \* Nov 25; law of max. effic., Mailloux, Dec 9; polyphasal generators, Pupin \* 23-**91**

*El Eng* the Perret (full) \* Jan 6; law of effic., Mailloux, Jan 18; alt. cur., Stanley \* Mar 2; gearless, Short \* Apr 13; Excelsior, Muldaur \* Sep 14; Lundell fan \* Dec 7-**92**

*El Rev Lond* simple \* Apr 13; alt. cur., Tesla's new system \* June 15, ed. 22 \* 22-**88**; design, Snell, Feb 1; speed reg., Deprez, Apr 26, *Compt r*; regulation, Crocker *El Rev Lond* \* June 14; alt. cur., evolution of new type, Patten (full) \* Oct 11-**89**; armature reactions, theory, Swinburne \* Feb 14, 21, Mar 28, Apr 4; op. with high tension curs., Sperry \* Feb 21, 28; design, Esson \* 28 \* Mar 7, 14; Tesla's alt. \* Aug 22, Oct 3-**90**; alt. cur. design, Weston \* Apr 17; Hutin & Leblanc's alt. cur. \* July 24; Edison's \* Aug 21-**91**; leakage, Ives \* Jan 22, 29-**92**

*El Rev* Liebig, Feb 25; alt. cur. and transformers, new system, Tesla \* June 2, 9, Weyde \* July 14; service charges basis, Lufkin, Sep 22-**88**; Bradley alt. cur. imps. \* June 22; alt. cur. Patten \* Sep 28-**89**; armature reactions, theory, Swinburne \* Mar 15; imps. do. \* Apr 19; Tesla's alt. cur. pats. \* Aug 16; rates basis, Lufkin \* 30-**90**; Eikemeyer's novel \* Mar 28; Edison small slow speed \* May 30; the perfection of stationary, Crocker \* June 6; alt. cur., Hospitalier, Sep 12; Bradley's alt. cur. \* Oct 2; perfect, Everett, 31; aut. op. at any speed or torque, Leonard \* Nov 28-**91**; alt. cur., Stanley \* Mar 12; Ryan series reg. test, Bliss, Dec 31-**92**, *Sib J Eng*

*El Wld* the Patten \* Jan 7; effic. tests, Crane \* Feb 4; alt. cur., Duncan (full) \* 25; Liebig, Mar 3; reg., priority of invention, Sprague \* Apr 7, 14; cal. and designing, Crocker \* 28; alt. cur. and transformers, new system, Tesla \* June 2; the Lugo \* July 14; service charges, basis for cal., Lufkin \* Sep 8; designing, Owens \* Nov 17-**88**

*El Wld* alt. cur., Tesla, May 25; reg., Crocker (full) \* June 1, discuss. \* 8; the Perret \* Feb 2, July 6 \* Aug 3; alt. cur., ev. of new type, Patten (full) \* Sep 28; Industries' prize, n \* Dec 7; new prin. of constructing, Mailloux \* 28-**89**

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*El Wld* relation to elec. lighting Co's. Fitzgerald \* Feb 1; op. with high tension curs., Sperry, 15; design, Esson (full) \* Mar 22, 29 \* Apr 5, 12; the Zipernowsky-Deri-Blathy synchronous \* Mar 29; Perret multipolar \* July 26; alt. cur., new types \* Aug 16; Van Depoele induction \* 16; rates basis, Lufkin, diagrs. \* 30-**90**

*El Wld* work of Dow, in torpedo service, Apr 18; alt. cur., Duncan \* May 9, 16; perfection of stationary, Crocker \* May 30, discuss. June 6; alt. cur., Hospitalier \* Aug 29; Frankfort-Lauffen three-phase, Hering (full) \* Oct 31 \* Nov 7; aut. op. at any speed or torque, with max effic., Leonard \* Nov 28-**91**

*El Wld* magnetic leakage, Ives (full) \* Jan 2; alt. cur., Stanley (full) \* Mar 5; alt. cur. self starting and exciting synchronous, Patten \* Apr 2; cal; Bedell, diag. \* 30-**92**

*Eng* alt. cur., ed. Nov 20; the Short gearless *E News* \* Sep 5-**91**; in workshops, Jenkin *Inst CE* \* v 102-**90**; small, effic., Clifford, abs. v 91-**88**, *Am Acad Arts & Sci* v 22-**87**; *E Rec* \* Nov -**90**; cal., Bedell, inset *F Inst* \* June -**92**

*Pwr* the Baxter \* Dec -**88**; Thomson's \* Jan; reciprocating \* Feb -**89**; Simple \* Jan -**90**; (various) \* Jan -**92**, *Elec Industries*; (growth of business) Pope *R & Eng* Sep -**89**

*Sc Am Sup* the Menges thermo-mag, generator \* Feb 18; simple, making, Hopkins \* Apr 14; charges, basis for cal., Lufkin, Sep 22, Nov 3-**88**; the Tesla \* Apr 6-**89**; home made, Parkhurst \* Aug 2-**90**; small, Hopkins \* Jan 3-**91**

*St R J* building, Short R. Co. \* Oct -**90**; max. effic. conditions, Leonard, Mailloux, Jan-**92**; small, effic., Clifford *Tech Q* Sep -**87**, Feb -**89**; small, comparative working expenses of, Korte *The Eng* Jan 22-**92**, *Zeit deut Ing* -**91**. See also DYNAMOS; ELEC. generators; RAILROADS, elec. motors

NAVIGATION, Bennett, *El Rev Lond* Apr 10-**91**.

OHM's law, extension of elec. mo. force and Oudin *El Eng* Dec 30-**91**; expt. proof, Mayer \* July 9, *El Rev Lond* Aug 1-**90**; units, the volt, ohm and ampere, Nipher \* Apr 27, ohm det., Wuilleumier, July 13-**88**, suggestions, J. V. Jones (full) Sep 12; the Evershed *El Wld* \* Jan 11-**90**; alt. cur., Swinburne \* Dec 19-**91**; units, ohm, Glazebrook, Jones *Eng* Sep 26-**90**, new det. of *Sc Am Sup* \* Feb 16-**89**; law and electro-therapeutics, Winton, July 26, expt. proof, Mayer \* Aug 2-**90**, *Am J Sci.* See also ELEC. units

**Electric OMNIBUS**, London *Sc Am Sup* \* Mar 2-**89**, *El Eng* ORE-dressing, Tilly Foster mine, McDowell *E News* Oct 4-**90** ORGAN, control, Hope-Jones *El Rev Lond* Jan 15-**92**; Wacker's action *El Wld* \* Nov 23-**89**; organs, Swinburne \* July 4-**91** OSCILLATIONS, Hertz's researches, Tunzelmann *El Eng* Feb \* Apr, May \* July \* Aug, Joubert \* Oct -**89**; in air, Trowbridge *El Rev Lond* Oct 17, (full) *El Rev* \* Dec 6-**90** PARCEL exchange system, Bennett *El Rev Lond* \* Sep 4, *Eng* \* Sep 25-**91** PATENTS, U. S. stats., Lockwood *El Eng* Feb -**88**; see *El Rev* files, especially 1890, progressive \* Mar 26 \* Apr 16 \* June 4-**92** PIPE bending *El Wld* \* June 18-**92** POLYPHONE, Zigang's *Sc Am Sup* \* Oct 12-**89** PORTELECTRIC Co's transport. system, N. E. *El Eng* \* May 27, Pope report *El Rev Lond* June 5 *El Rev* \* May 30-**91**, do. *El Wld* May 23-**91**, carrier \* Oct 10-**90** POTENTIAL, high, phenomena, Skinner *El Wld* \* May 7; differences, Negbaur, Nov. 26, Dec 3. 10-**92** POWER, elec. motor and st. locom. test, Manhat. eleva. R., Moss., insets *Am C E* \* v 23-**90**; distrib., Spaulding, insets *Cassier's* \* Dec -**91**; and steam, Wright, Aug -**92** *El Eng* standards of econ. in gen. of, Swetland \* Aug 27-**90**; comparative cost, effic. of large and small motors, Wheeler, Apr 29; econom. limits of large units, Church \* Dec 2, 9-**91**; Edison works, Schenectady, N. Y., Martin (full)\* Feb 3; plant at Chic. World's fair, Collins \* Mar 23-**92**; distrib. by alt. curs., Tobey *El Rev Lond* \* Feb 5; distrib. by direct curs., Dow, 26-**92**; rates *El Rev* Aug 1-**91** *El Wld* measurement by voltmeter, Swinburne \* Apr 18; measurement of any elec. cur. to any circuit, Ayrton, Sumpner \* May 2, 23; measurement developed by alt. curs. in any circuit, Hering \* Dec 26; distrib. by alt. curs.. Stanley \* June 13-**91**, Leblanc *Lum Elec* *El Wld* distrib. by direct curs., Dow, Feb 6; by alt. curs., Stanley, 6; Thomson's law of economy, Carter, July 30; station distrib., Unwin, Aug 20, 27; supply cost, Hopkinson, Dec 3, 10, 24; gen. at coal-fields and transmiss. to industrial centers, Thwaite \* 31-**92** *Eng* econom. limit of large units, Church, Jan 8; altruistic effects, Perrine *E Mag* Jan -**92**; technically considered, W.

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Allen *E News* \* Nov 1-**90**; distrib., Spaulding *Pwr* \* Dec -**91**, *Am M E*, *Sc Am Sup* Jan 16; gen. in coal-fields, Thwaite *The Eng* Dec 2-**92**. See also ELEC. motors; RAILROADS, elec. power stations

POWER Transmission, *Am Min* present status, Rothwell v 17 -**89**; in mining operations, Spaulding, insets (full) \* v 19 -**91** *El Eng* (energy) \* Feb -**88**, *Industries*; Kapp *El Eng* Mar 25; at very high potens. \* Apr 8; Leonard (full) Sep 2-**91**; long dist., Hart \* Jan 13; high poten., E. Thomson, Mar 23; long dist., Scott \* June 15-**92**

*El Rev Lond* Sprague, Mar 22 \* 29, May 10; long dist., from over compounded gens., Serrell \* Dec 6-**89**; Kapp, tables, Feb 20, Mar 6, (full) July 17 \* Aug 7-28-**91**; Frankfort plan, Hering, Apr 8; multiphase and distrib., Reckenzaun, Apr 29 \* May 13, June 24; long dist., Thwaite, Dec 16-**92**

*El Rev* Roberts \* Aug 31-**89**; Kapp (full) Aug 8; long dist., Frankfort, alt. curs. differing in phase (rotary curs.), Dolivo-Dobrowolsky \* Sep 19; Lauffen-Frankfort, Kapp \* Oct 10-**91**; long dist., Hart \* Jan 16; high poten., E. Thomson, Mar 26; long dist., Scott \* June 25; by alt. curs., Kapp \* Sep 17; future, Oct 15-**92**, *Industries*; *Electrician Lond*

*El Wld* long dist. cals., Serrell, table, May 25; Roberts \* Aug 17; long dist., from over-compounded gens., Serrell \* Nov 16-**89**; Mar 14; high pressure, at Oerlikon, May \* Apr 18; Lauffen-Frankfort plant, Hering (full) \* Sep 26 \* Oct 31 \* Nov 7; by alt. curs., Dolivo-Dob. \* Oct 10-**91**

*El Wld* Lauffen-Frankfort tests, Hering, Jan 9, discuss. (full) Mar 5, effic. \* July 2; diags., Schlesinger \* Mar 5; Bell, 19; high poten., E. Thomson, 26; multiphase, Reckenzaun, May 21, June 11, July 23; long dist., Scott (full) \* June 18; effect of harmonics on alt. cur., Rowland, Dec 10; gen. at the coal-fields and transmiss. to industrial centers, Thwaite \* 31-**92**

*Eng* ed. Feb 20, 27, Mar 6-**91**; cost, Mansfield, n *E & Min* June 23-**88**; Rothwell, Jan 5-**89**; in the west, July 23-**92**, *El Eng*; Nevada mill *E News* Apr 12-**90**; alt. curs. for \* Aug 22-**91**; Hering, Mar 19-**92**; Sprague *F Inst* \* Mar-**89**; Lauffen-Frankfort, table, Aug; Griffin (full) Sep -**92**; by alt. curs., Stort abs. *Inst C E* v 106 -**91**; cost, Lahmeyer, v 109 -**92**, *Elek Zeit* -**91-92**; Geipel *Inst M E* Feb -**88**

*Pwr* long dist., Hart, Feb, Jackson, Apr, high poten., E.

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Thomson, May; Griffin \* Oct **-92**; Morris *R & Eng* May **-92**; \* Oct **-90**, *Genie Civil*; Sprague (full) *Sc Am Sup* \* July 20, 27 \* Aug 3 **-89**; \* Mar 3 **-88**, *Industries*; long dist., Hart *Tech Q* \* Apr **-92**; Kriegstettin to Solothurn, expts. *The Eng* Apr 13 **-88**; West, Jan 16; Lauffen-Frankfort install. \* Oct 2, 9, oerlikon alternator \* **23-91**. See also RAILROADS, elec. power stations

**PROJECTILES**, elec. welded, Maxim *Cassier's* \* Oct, *El Rev* Aug **6-92**

**PUMPS**, pumping in collieries, Brain *El Eng* Jan **-88**; Dittman's vac. *El Wld* \* June 4 **-92**; Hall's pumping plant *E News* May 5 **-88** \* Mar 15 **-90**; three-cyl. elec., Gould Mfg Co. \* Nov 14 **-91**

**RAILROADS**, elec. working of, W. E. Hall *E News* July 12, limitations of steam and electricity in transport. **12-90**. See also RAILROADS, elec.

**RECORDING instrums.**, Holden, Drake and Gorham's *El Rev Lond* \* Sep 30 **-92**

**REGISTER**, Ongley *El Rev* \* Jan 31 **-91**

**REGULATORS**, Herrick *El Wld* \* Apr 5 **-90**

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*E News* non-condens., steam consumption of simple and, Williams, May 5; Westinghouse aut. \* 5-**88**; Jonson's balanced \* May 4-**89**; Strong's 250 h.p. trip-expan. vertical \* Sep 22; steam distrib. in single-acting, Rites \* Oct 20-**92**

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*The Eng* 200 h.p. hor., Crompton, Jan 20; portable self-propelling, Cooper, Apr 27; hor., Glasgow exhib. May 4, 4; trunk air-pump, str. Hector, June 8; a new tandem, Turner, July 20, 20; triple semi-port., Nottingham Show, 27; 800 h.p. tandem, with Proell gear, Sep 7, 7; Willan's trip-expan. central valve, Dec 14-**88**; 400 h.p. condensing, Brussels exhib. \* Feb 22; 350 h.p. Carel's, July 5; trip-expan., with Corliss gear, 26; tandem, Berlin elec. station, Sep 6; the Globe \* Nov 29; 400 h.p. Sulzer \* Dec 6-**89**

*The Eng* trip-expan French, Paris exhib. \* Jan 10, 10; Fives-Lille condens., do. \* Mar 14, 14; str. Hercules, 1830, inset \* Mar 21 \* Apr 11, gear \* May 2; and trip-expan., ed. 9; Watt's, 1829 \* June 27; 250 h.p. vertical \* Aug 22, 22; 2000 h.p. condens. \* Oct 3-**90**; trip-expan. vertical condens. for elec. lighting, inset \* Feb 6, 6; Corliss mill \* Mar 13, 27; 1000 h.p. trip-expan. mill \* Aug 7-**91**; 1000 I. h.p. do. Indian Midland R. \* Aug 26-**92**. See also AIR compressing — BLOWING — MARINE — PUMPING engines, etc.

COMPOUNDING centrif. and load governing by rotary piston valve, Aldrich *Am M E* -**92**

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**Engines, Corliss** econ. of compound and single cyl., Jacobus Am ME \* v 12 -**91**; cut-off and compression in, Stanwood Cassier's \* Jan; valves adjusting, Pray \* Feb -**92**; 2500 h.p. mill Eng \* Mar 23, inset \* Apr 6, 6; hor., inset \* Apr 20-**88** \* Jan -**89**; hor., Paris exhib. \* Feb 14 -**90**; cut-off and compression, extending range of, Stanwood \* Dec 18 -**91**; with non-detaching gear \* Aug 26 -**92**

**CRANK** pins, method of securing, Collins Am ME -**88**; crank device, Micheles Eng \* July 10 -**91**; crank angle for max. vel. of piston \* July 15 -**92**

**CYLINDER** condensation, of steam in, surface condensers, Whitham Am ME -**88**; effect of steam jacket on, Bird \* v 12 -**91**; thermo-elec. method of studying, Hall El Eng \* June 24, do. El Rev Lond \* July 3, do. El Rev \* June 27, do. El Wld \* June 20 -**91**; Conover condenser El Rev \* July 30 -**92**; condensers, theory, Dwels.-Dery Eng Sep 13; action of steam in, expts., English \* Nov 8, 15 -**89**

*Inst C E* glass ap. for rendering visible effects of, Donkin, abs. v 97 -**89**; *Bul Soc Mul* -**89**; heat expenditure, the cyl. heated externally by gas-flames, Donkin, expts., inset, do. Dwels.-Dery, Unwin trans. (full) *Inst C E* \* v 98 -**89**; cyl. walls temp. taking at different depths in the metal, Donkin \* v 100 -**90**; thermal action of cyl. walls, Dwels.-Dery, abs. v 103 -**91**, *Bul Soc Mul* Aug, Sep -**90**; movement of heat in, Kusch, abs. *Inst C E* v 107 -**92**, *Zeit deut Ing* -**91**; and re-evap., expts., English, insets (full) *Inst M E* \* Oct -**89**, initial condens., during admission, do. May -**92**; thermo-elec. method of studying, Hall, R & Eng \* Feb -**92**, *Am Inst Elec Engrs*

*The Eng* ed. Dec 21 -**88**; theories of, ed. Mar 8; Donkin's co-efficient, ed. 29; and re-evap. in jacketted cyl., expts., English \* Nov 8 -**89**; cyl. walls temp. cal., Donkin, diags. \* Sep 25 \* Oct 9; thermo-elec. method of studying, Fitz-Gerald \* Oct 16 -**91**; expts., Donkin, ed. July 15; Dwels.-Dery, cor. Aug 26, Sep 2 -**92**

**CYLINDERS**, proportioning. Thurston Am ME v 9 -**88**; two cyls. vs. multi-cyl. engines, Green & Rockwood -**92**; deposits anal., Stillman Cassier's Nov -**92**; action of steam in, expts., English Eng \* Nov 8, 15 -**89**; expts. on temp. of metal, Donkin, inset *Inst C E* \* v 106 -**91**. See also ENGINES, cyl. condensation

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PISTON packing, new principle in, Sweet *Am M E* \* v 9 -**88**; friction of packing rings, Denton \* v 10 -**89**; rod packings *Pwr* \* Jan -**88**; rod breakages, report *R & Eng* \* Nov -**90**

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RIGG's high-speed revolving *The Eng* Jan 27-**88**

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STRAIGHT Line, 100 h. p. *El Wld*\* Aug 24-**89**

STRONG's trip-expans. vertical *El Eng*\* Sep 28, *El Rev* \* Oct 15, 250 h. p. *E News* \* Sep 22, *Pwr* \* Oct -**92**

SULZER, Brussels exhib. *The Eng* Aug 17-**88**

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*Eng Royal Agric. Soc.* at Newcastle, Shaw, cor. \* Jan 6; steam consump. of compound and non-comp., Willans, Mar 16; Highland Soc. Show, Nov 16-**88**; Soc. of Arts, ed. Mar 29; Dulwich College experimental \* Nov 1; at Whitworth eng. lab. trials, Manchester, Reynolds, Dec 13-**89**; Sulzer type hor. trip-expans. 200 h. p., Schröter \* Dec 5-**90**; compound, expts., Reynolds *E & Min* \* Aug 9-**90**

*E News* several types, Carpenter, table, Aug 2-**90**; econ. of non-condensing, simple, compound and triple, Willans, and discuss., insets (very full) *Inst C E* \* v 93 -**88**, reply to cor. \* v 96, Westinghouse test, Alley, n v 96 -**89**; at Whitworth eng. lab., Manchester, Reynolds, and discuss., inset (full) \* v 99 -**90**

*Pwr* compound, Howland mill, New Bedford, Mass. (full) \* Dec -**89**; Utica, N. Y. Steam Cotton mills power plant, Carpenter \* Aug -**92**; econ. of non-condens., Willans *R Gaz* Aug 6 -**88**; expts. at Mass. Inst. Tech., Purinton, general review of tests, Peabody (full) *Soc Arts Mass* -**88**; Purinton *Tech Q* \* Feb -**88**

*The Eng* econ. of non-condens., Willans Apr 6; Highland Agric. Soc. Aug 3-**88**; Soc. of Arts \* Feb 22 \* Mar 1, 8-**89**; Royal Agric. Soc. July 4-**90**; colliery, econom. use of steam in, McLaren, July 17-**91**

THREE-cylinder, Paris exhib. *Eng* July 12-**89**

UNDERGROUND hauling, Ilkeston colliery *Eng* \* Nov 23-**88**

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*Pwr Fishkill* Corliss with Cite's releasing gear \* Aug -**88** \* Aug -**90**; link motion, Lyne \* Apr, June -**89**; Corliss valves setting \* Mar -**90** \* Nov -**92**; valves \* June -**90**; Child's piston valve *R & Eng* \* Jan -**89**; radial gears, J. R. Smith \* Feb \* Mar, Morton radial \* May -**90**; valves, Hawley *Sc Am Sup* \* Jan 31 \* Feb 14-**91**; Proell gear, 800 h. p. tandem comp. *The Eng* Sep 7, 7-**88**; the Cross gear \* Apr 4-**90**. See also ENGINES, slide valves.

**WESTINGHOUSE** aut. compound *E News* \* May 5, *R Gaz* \* May 4-**88**

**England**, taxation, local expenditure, ed. *Eng* July 26-**89**; trade relations with Am., McCormick, and ed. Apr 8, 29-**92**; coal-ing stations, defences of, Hong Kong *The Eng* \* Jan 18, Singapore \* Feb 1, Aden \* Mar 15, Cape of Good Hope \* Apr 5-**89**. See also BRITISH; GREAT Britain

**English** notes *E & Min* Aug 24, 31, Sep 14, 21, Oct 12, Nov. 23-**89**. See also GREAT Britain

**English**, Thomas A. *Inst C E* v 97 -**89**

**Engraving** rail sections, 4 styles, etc., ed. *E News* \* Dec 27-**90**

**Entomology**, Riley (full) *Sc Am Sup* Jan 17-31-**91**

**Ericsson**, John *Eng* Mar 15-**89**, Church, bk. review, Feb 13-**91**, por., inventions, etc., and ed. *E News* \* Mar 16-**89**, *Locom* Apr -**89**, por. (full) *R & Eng* \* Apr -**89**, life of, Church, bk. review, Jan -**91**, por *Sci Am* Mar 16, Capt., and his work, 23-**89**, MacCord (full) *Sc Am Sup* Feb 8-**90**, *Stevens Indic*, ed. *The Eng* Mar 29-**89**

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**Ethics** and railroad supplies *R & Eng* Dec -**89**

**Etna**, volcanic eruption *Sc Am Sup* Aug 27-**92**

**Evaporation** of moisture from various substances, expts., Worrell, table *Sc Am Sup* July 7-**88**

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**Evolution** *Locom* Aug -**89**; mental, in man and lower animals, Bodington *Sc Am Sup* Aug 6-**92**

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**Excavating** and excavators, Panama Canal, Willans, insets *Am CE* \* v 19 -**88**; steam, Clements *Am ME* \* v 9 -**88**; methods and cost of working by steam excavs., Clements *E News*\* May 26, June 9-**88**; a great rock excav., Tilly Foster mine, Brewster's station, N. Y. \* Apr 20; excavator for sewer trenches \* Sep 27-**89**; and hoisting machinery, the White, Minn. \* June 6-**91**; trenching and pipe laying, Fitz Gerald *E Rec* \* June 15; timbering shafts, Croton aqueduct \* Aug 17, 31-**89**; at Panama canal, Nansouty, abs. *Inst CE* v 94 -**88** \* *Genie Civil* \* v 13 -**88**; Darby broadside steam digger *Sc Am Sup* \* Sep 1-**88**, *Iron.* See also DREDGING; MINING; SEWERAGE; TUNNELING

**Executions**, methods, n *Locom* Jan -**90**. See also ELEC. execution

**Exhibitions**, ethics of great, ed. *Eng* July 4-**90**. See also ELEC. exhibs.

AGRIC. Soc., Royal, Show, Doncaster *Eng* \* June 26; *The Eng* \* June 19, 26-**91**

AM. Institute fair, N. Y. *Sci Am* Oct 20-**88**

CRYSTAL Palace Elec. *The Eng*\* July 22-**92**

EDINBURGH, 1890 *Eng* inset \* Apr 11-25, May 30, June 20 \* July 11, 25 \* Aug 15, 29 \* Sep 19, 26 \* Oct 10; *The Eng* Mar 28, buildings \* May 2-**90**

FRANKFORT Elec., plan *Eng*\* July 18-**90** \* May 8, 22, 29 \* June 5-July 24 \* Aug 7-28, Sep 4 \* Nov 13, *The Eng* \* Sep 18, 25 \* Oct 2-**91**

GLASGOW Internat. *Eng* Mar 23, plan \* Apr 20, May 4, 25, June 8-29, July 13 \* Aug 3, 10, Nov 9-**88**, *The Eng* Nov 18-**87**, Apr 27, May 11, June 1-**88**

MOSCOW, French Elec. at *Eng*\* Aug 21, 28 \* Sep 4, Oct 2-**91**

NAVAL. Royal, London *Eng* \* Feb 13, May 1 \* June 5, 12 \* July 17-31 \* Oct 2-16 \* Nov 27 \* Dec 11-25, *The Eng* \* Mar 13 \* May 1-29 \* June 5-26 \* July 10-31 \* Aug 14, 21-**91**

PARIS, notes *El Wld* Oct 5, 12-**89**, ed. *Eng* \* Apr 27, May 11, inset \* June 1, 29. ed. July 27 \* Aug 10, 31. ed. Sep 28 \* Nov 2-

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U. S., World's Columbian, Chicago, 1893, *Am C E* Gov't building dome ironwork. McGuire, insets (full) \* v 26-**92**; *Century* architecture, Van Brunt, May — Aug; Kirkland *Chaut* Dec -**92**

*El Eng* electricity at, Calkins \* Nov 23-**92**; *El Wld Electric*. bld. plan (large scale) \* Oct 24-**91**, electric. at \* Aug, Sep, Machin. bld. \* Oct 1, electric. at \* Dec 3-**92**

*Eng* Dec 27-**89**, ed. Mar 7, Berger on Chicago, Wood May 2, Berger July 4, Oct 3, Dredge Dec 5, ed. 5, 12 \* 19-**90**, Jan 2, ed. Feb 20 \* 27, ed. Mar 27 \* Apr 17 \* May 1, inset 26 \* June 5, inset 12, ed. 19, inset 26 \* July 10, ed. 17, 24, inset 31, 31, ed. Aug. 7 \* Sep 18, n \* Oct 9, 23, 30 \* Nov 6, inset 13 27, inset \* Dec 4, 4, Dredge, inset 11, 11, 18, 18, 25-**91**; \* Jan 1, Dredge, inset 8-29 \* Feb 5-19 \* Mar 4-25, inset \* Apr 8-29 \* May 6, Gov't. bld. 20, 27 \* June 10, 24 \* July 1-29 \* Aug 5, Dredge, 12, Wood report, 19, 26 \* Sep 2, cost of exhibiting, 9, 16, 23 \* Oct 28 \* Nov 11-25, Transport. bld. \* Dec 2, 9, Dredge, Electric. bld. \* 16-30, Dredge, 30-**92**

*E Mag* mechan. display, Atkinson, Apr; buildings, Freitag \* Nov -**91**, Manuf's bld., greatest of all fair buildings., do. \* July; and death rate of 1893, Bayles, Dec -**92**

*E News* original buildings, ed. Oct 5-**89**, novel plan, Jennison \* Mar 15, ed. 29-**90**, vs. N. Y. City, ed. Aug 10, proposed N. Y. site for, ed. Sep 29-**89**, general plan \* Mar 28 Sep \* 26, birds-eye view \* Oct 31, figures 31-**91** \* Jan 16, n 23, 30, buildings, inset \* Feb 13 \* Mar 5, dome 12, 26, Apr 9 \* 21, Mining

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*E Rec* blds. \* June 25 \* July 9, insets \* Aug 6, 13, 27 \* Sep 17 \* Oct 8-22, Machin. Hall details \* Nov 19, 26 \* Dec 24, 31-**92**; *F Inst* inset \* May -**92**; blds. foundations and floors, Gottlieb *J Assoc E Soc*s Dec -**91**; the designers of the fair (architects), pors., Millett *Harper's* \* Nov -**92**

*R Gaz* Oct 3, 11, n Dec 6-**89** \* Aug 7 \* Sep 25-**91**, buildings \* July 1, \* Aug 26 \* Sep 16, 23, \* Oct 14; World's Congresses of 1893, Bonney, por. *Rev of Revs* \* Oct -**92**; *Sc Am Sup* (full) Feb 15-**90**; Dredge (full) Jan 3, tower \* Apr 4, \* Aug 29-**91**; making of the white city, Bunner *Scribner's* \* Oct; Chicago's part in, Mac Veagh, Nov; decoration of, Millet \* Dec -**92**

*The Eng* \* July 31 \* Aug 14 \* Sep 18, battleship Oct 16, regulations 16 \* 23 \* Nov 6, 13, 20, 27, 27 \* Dec 25-**91** \* July 1, 22 \* Aug 12 \* Sep 9, 23, general plan \* Oct 28-**92**

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**Explosives**, historical notes, Guttmann *Eng* Nov 8-**89**; expts., So. Wales mining, Sep 12-**90**; firing point table, n *E Mag* Apr -**91**; value of hydrocarbon explosives for mining, Walker *E & Min* Aug 11-**88**; modern, Deering, Feb 23; high, notes, Dec 28-**89**; use of in fiery mines, Nov 29-**90**

*E News* high, list of. Mar 31; and their composition, Foster, list, June 30, July 7-**88**, classification of, do. Jan 12, high, properties and use of, July 6-**89**; relative strengths of high, Walker, Jan 31-**91**; high, in warfare, Barber *F Inst* Feb -**91**; employment in presence of fire-damp, report, abs. *Inst CE* v 99 -**90**, *An Mines* v 14 -**88**; and ordnance material, Emmiens, abs. *Inst CE* v 108 -**92**, *U. S. Naval Inst* pro -**91**; Deering *R Gaz* Feb 15-**89**

*Sc Am Sup* high and projectiles, Vreeland, Dec 1-**88**; Deering (full) May 18, *J. Soc Arts Lond*; recent develops. in high, Nursey (full) *Sc Am Sup* July 20, 27; notes, Hake (full) Oct 5-**89**; high, in warfare, Barber, May 21-**91**; Lippincott, Oct 1 -**92**; drying ap. in vacuum *The Eng* \* Nov 27-**91**, July 1-**92**

- Explosives, Ammonite**, expts. with *The Eng* July 17-**91**.  
 AZOIMIDE (new sodium salt) *Sc Am Sup* Jan 9-**92**  
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 CAKE-powder, perforated, for ordnance, Quick, abs. *Inst C E* v 97-**89**  
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 MELINITE disclosures, ed. *Eng* May 29-**91**  
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- Garbage** and town refuse disposal, Foster *Eng* \* Dec 18-**91**; crematories, Kilvington *E Rec* Feb 23-**89**. See also CREMATORIES; MUNIC. eng.
- Garland**, Thomas B. *Inst C E* v 109-**92**
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- BUENOS AYRES supply, Stevenson *Inst C E* v 103-**91**
- BUOY, steel *The Eng* Sep 13-**89**
- BURNERS, effic., expts., Bouvier *Eng* Mar 15-**89**
- CANNEL, ed. *The Eng* Sep 23-**92**
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- COQUEREL plant, Vitoux, abs. *Inst C E* v 105-**91** *Genie Civil* \* v 19 -**91**
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- Gas Engines, Ajax** single-acting, tests, Jamieson, report *The Eng* \* Aug 9-**89**
- ATKINSON's cycle *El Wld* \* June 6-**91**, 6 h.p. *Eng* \* Dec 28 -**88** \* Feb 22, com. report *F Inst* \* June -**89**, *Pwr* \* June -**91**, 6 h.p. and pump *Sc Am Sup* \* Feb 9-**89**, \* June 27. *St R J* \* June, *The Eng* \* July 3-**91**
- BECK, the *Eng* \* May 4, 11, tests, Kennedy *E News* June 9, *The Eng* May 4, 11-**88**
- CHARTER, the *Eng* \* Feb 10-**88**
- CYCLE, the, Ransom, insets *Inst C E* \* v 109 -**92**. See also GAS engines, Atkinson's
- FORWARD, the *Eng* \* Mar 8, 8, *The Eng* \* Apr 5-**89** \* July 11 -**90** \* Aug 21-**91**
- GRIFFIN, the *Eng* \* Apr 13, June 1, *The Eng* May 18, 25, June 1-**88**
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- PALATINE *The Eng* \* Dec 30-**92**
- ROBEY'S *The Eng* \* Oct 14-**92**
- ROLLASON, the *Pwr* \* Oct -**91**
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- STURGEON, the *The Eng* June 15-**88**
- TRUSTY, the, Wehman's *The Eng* \* Oct 2-**91**
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- LIGHTING, centenary of *Eng* July 29-**92**; incandescent, MacKean *E & Min* May 16-**91**, *J Soc Chem Ind*; st., Kan. C., cost of *E News* June 28-**90**; history *E Rec* May 9-**91**; Paris exhib., hist. of artif. illum., report (full) *Sc Am Sup* Oct 22, 29-**92**; by incandescence, Shapleigh (full)\* *Soc Arts Mass*-**89**
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**Gilbert**, William, of Colchester *Eng* Dec 20, 27-89, (full) *Sc Am Sup* Mar 29-90 *Eng*

**Gillham**, Francis *Inst C E* v 110 -92

**Gilsonite**, spec. from Uintah Cty., Utah, Raymond *Am Min* v 17 -89

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**Globe**, terrestrial, Paris exhib. *Sc Am Sup* \* June 22 \* Aug 10-89, *Genie Civil, La Nature*

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**CARLISLE** and mill, New Mex. *E & Min* June 2-**88**

**CERRO** de Pasco mining plant stamp mill, Transvaal *The Eng* \* Feb 15-**89**

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**HAILE** mine, Lancaster Cty., So. Car., Thies proc. at *Am Min* \* v 19 -**91**

**MORGAN** mine in Wales *Eng* June 22-**88**

Mt. Morgan mine, Queensland, Rickard, *Am Min* \* v 20 -**92**, *E & Min* \* Aug 22, 29-**91**

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**Gooch**, Daniel *The Eng* Oct 18-89  
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**Graphophone**, Edmunds *Eng* Sep 28; and phonograph (full) *Sc Am Sup* \* Oct 27-**88**. See also under PHONOGRAPH

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- BREECH-loading, mechanism for 10-in. *Eng* \* June 10-**92**; 12-in army rifled *R & Eng* \* Sep -**91**, *Iron Age*
- BOFORS cast steel, Michaelis *Am Min v* 16-**88**, *Sc Am Sup* Sep 15-**88**
- BROWN segmental wire-wound *E News* \* Nov 24-**92**, *Sc Am Sup* \* Jan 11-**90**, Wittman \* Dec 24, *The Eng* \* Nov 11-**92**, *Am Min*
- CANET quick firing, with elec. training gear *El Rev* \* Sep 27-**90**; 66-ton, test *Eng* Feb 27, Sep 4; vs. Krupp, Dec 25-**91**, Jan 1, 15-29, Feb 5, Apr 1, May 20, June 3, 10-**92**; large, for Japan *E News* \* Jan 30; and ar. trials *Sc Am Sup* \* Jan 16, 16-**92**; *The Eng* \* June 12 \* Dec 11-**91**
- CANNON, mod. high power rifled, development, Calif (full) *R & Eng* \* Jan \* Feb, Apr — \* Oct -**89**
- COLT's navy revolver, com. report *F Inst* \* May -**90**
- DRIGGS-Schroeder quick firing *Eng* \* Oct 28-**92**
- DYNAMITE, development, Batcheller *E Mag* \* Sep -**91**; 15-in., trial *Sci Am* Feb 16-**89**; Zalinski pneu. *Sc Am Sup* \* May 12; pneu., Haig \* Mar 10, do. *The Eng* Feb 3, Zalinski, 17-**88**; U. S. navy report, Mar 29-**89**; the Graydon \* Jan 30-**91**; pneu. sea-coast (full) \* June 10, 10-**92**
- ELSWICK *Eng* \* Oct 25 \* Nov 1, 15-29-**89**, Naval exhib. \* July 17, gallery, do. *The Eng* \* May 1-**91**; 6-in. disappearing carriage \* Mar 11-**92**
- FACTORIES, of Forges and Chantiers, Havre (full) *Sc Am Sup* \* June 21-**90**; Royal ordnance, constitution of, Great Britain, Anderson *The Eng* Oct 9-**91**
- FIELD, and mountain, Armstrong *Eng* \* Dec 6-**89**; Russian field and coast *Sc Am Sup* \* Sep 1-**88**, *The Eng*
- FRENCH artillery, insets (full) *Eng* \* Jan 3-**90** — Apr 24-**91**; quick firing, ed. Aug 12-**92**; mod. *Sc Am Sup* \* July 19-**90**
- GERMAN magazine rifle *Eng* \* May 15, new *Sc Am Sup* \* Jan 3-**91**
- GIFFORD liquid-gas *E News* \* Aug 9, carb. acid *Sc Am Sup* \* Aug 30-**90**
- GRUSON'S quick fire *R & Eng* \* Apr, *The Eng* \* Jan 10-**90**

- Guns, HOTCHKISS ordnance *Sc Am Sup* \* July 18-**89**, revolving cannon \* Mar 7-**91**, *Eng*; Paris exhib. *The Eng* \* June 7-**89**
- HOWITZER, 11-in., Armstrong *Eng* \* Jan 6-**88**; cast iron, Spain \* Mar 11-**92**; high angle battery *The Eng* \* July 18-**90**
- KRAG-Jorgensen repeating rifle *E News* \* Oct 6, *R & Eng* \* Oct -**92**
- LEBEL magazine rifle *Sci Am* Oct 27, *The Eng* Sep 28, 28-**88**
- LONGRIDGE, the *Eng* \* May 4, 11, *The Eng* May 11-**88**
- MACHINE, Miller's aut. indicator for *Sci Am* Mar 9-**89**
- MAGAZINE rifles, rifle-mark, ed. *Eng* \* Feb 6; the Mannlicher (our new) \* Mar 6; the Mauser \* Apr 3; Swiss \* Oct 2; Rees' \* Nov 27-**91**; new *Sc Am Sup* Apr 5-**90**; mag. guns development, A. Russell \* *Soc Arts Mass* -**90**; *The Eng* \* Apr 4-**90**; new \* Feb 6; small arms, tests, N. Y. \* Sep 4-**91**
- MAXIM aut. machine, inset *Eng* \* Jan 27; 3-pounder \* June 22-**88**; \* Oct 9, 16-**91**; *Sci Am* Feb 16-**89**; *Sc Am Sup* \* July 7, *The Eng* June 1-**88**
- MORTARS, U. S. cast iron coast *Eng* \* Mar 18, 25 \* Apr 1-22, do. 12-in. breach-loading rifled *E News* \* Dec 8, *R & Eng* \* Dec -**92**; 12-in. manuf., Fuller, Connet *Sc Am Sup* \* Sep 6-**90** \* Jan 17-**91**, *Steven's Indic*; 12-in. rifled, S. Mansfield *Soc Arts Mass* -**91**; mod. breech-loading rifled construct., A. Russell *Tech Q* \* Apr -**92**; Whitworth mounting for high angle fire *The Eng* \* July 24-**91**; U. S. breech-loading \* Dec 9-**92**
- MOUNTINGS, stra. Devastation and Rupert *The Eng* \* Apr 24 -**91**
- NORDENFELT, disappearing turrets for *Eng* \* Oct 30-**91**; light quick fire batteries *The Eng* Jan 20, Feb 24-**88**
- PNEU., torpedo, Zalinski *Eng* July 12-**89**, do. *R & Eng* \* May -**88**; *Sc Am Sup* \* Oct 12; the Dudley *The Eng* Sep 6-**89**
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- RIFLES of mod. armies *R & Eng* Jan -**88**; military rifle development, Calif \* Jan \* Feb -**89**, do., reduction of calibre in, Dunn *Sc Am Sup* Dec 22-**88**
- RUSSIAN artillery in 1888 *The Eng* July 27-**88**
- SANSPAREIL, the *The Eng* \* Feb 6-**91**
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- Guns, Steady** platform, Tower's *Eng*\* Apr 26-**89**  
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- Hack**, Thomas *Inst C E* v 93 -**88**  
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**Hall**, Richard T. *Inst C E* v 99 -**90**  
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**Hamand**, Arthur S. *Inst C E* v 97 -**89**  
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- ANTWERP port works, Matthys abs. *Inst C E* v 101 -**90**
- ARDROSSAN works *Eng* Nov 1-**89**
- BARS, in tidal estuaries, Wheeler *Eng* Feb 7-**90**; imps., Haupt *F Inst* July, D'Auria, Sep, discuss., Haupt, Oct -**89**
- BAYONNE port *Eng* \* Dec 6-**89**
- BEACON lights and fog signals, Douglass *The Eng* \* Mar 29-**89**
- BILBAO *E News* \* Aug 31-**89**
- BORDEAUX port *Eng* \* Dec 13-**89**
- BRAZOS river imp. and, Craighill, Cortell, discuss. *Am C E* v 26 -**92**
- BREAKWATERS, concrete, Del. bay *E News* \* Jan 31; do., Schermerhorn report (full) *E Rec* \* May 16-**91**; and force of impact of waves, d'Auria *F Inst* Nov -**90**, Jan -**91**
- BREMEN works, abs. *Inst C E* v 96 -**89**, *Zeit deut Ing* -**89**
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- CALAIS works, France *Eng* \* May 17, inset, 24, 31-**89**; quay foundations, Betillard report *E News* \* Jan 4-**90**; Richou, abs. *Inst C E* v 101 -**90** \* *Genie Civil* v 15-**89**; inset *Inst M E* \* July -**89**
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- CHICAGO as a sea-port, maps *Eng* \* Feb 20, do. *Sc Am Sup* \* Mar 28-**91**; ed. *R Gaz* July 15-**92**
- CORK port, deep-water quays, Barry, inset *Inst C E* \* v 100 -**90**
- CORPUS Christi, Tex., deep-water project, Kent *E & Min* \* Aug 23-**90**

- Harbor**, DEFENCE, elec., Sims-Edison torpedo *E I Wld* \* Apr 25 -**91**
- DELAWARE breakwater imp. *E News* \* Feb 6-**92**
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- DOCKS, N. Y. bulk-head construct. *E News* \* May 25-**89**; Royal Albert, blowing up of basin wall at, Thomas \* Sep 20-**90**. See also DOCKS; HAR., Hull — Limerick, etc.
- DUBLIN port, Griffith, insets *Inst M E* \* July -**88**
- DYKES, brush, spec. for, Craighill *E News*, Oct 19-**89**. See also DIKES; HOLLAND, do; RESERVOIRS; RIVERS, imp.
- ENGLISH, new schemes *Eng* Jan 23-**91**; Brit., and water-ways *The Eng* Aug 5-**92**. See also HAR., Goole
- GALVESTON, Tex., entrance imp., Wisner, cor. *E News* Dec 6-**90**; prob., Haupt *F Inst* Oct -**91**
- GOOLE port imp., E. coast, England *The Eng* \* Dec 20-**89**
- GREAT Yarmouth, Ayers, cor. *Eng* \* Dec 13-**89**
- HAMBURG, Alster lock widening, Roepel *Inst C E* v 107 -**92** \* *Deut Bauz* -**91**
- HAVRE port *Eng* Oct 25, Nov 8 \* 29-**89**; imp. of sea-ports of Seine, LeBrun, abs. *Inst C E* v 93 -**88**, Rochemont *Mem Soc Ing Civils* \* Mar -**88**; imp. n \* *Sc Am Sup* Apr 13-**89**
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- INDIA, West of, Portuguese R., Sawyer, insets *Inst C E* \* v 97 -**89**
- ITALY ports of, Gatto, abs. *Inst C E* v 104 -**91**, *Il Polit* -**90**. See also HAR., La Rochelle — Naples
- JETTIES as applied to har. entrances, U. S., Haupt *Inst C E* v 99 -**90**. See also RIVERS, jetties
- LAKE Ontario natural harbors *E News* \* Mar 8-**90**
- LA ROCHELLE works, Italy, com. report, abs. *Inst C E* v 95 -**89**, *Giorn Genio Civil* June -**88**
- LIMERICK dock walls. failure and construct., Hall *E Rec* \* Mar 28-**91**, *Inst C E*
- LYNN Haven Bay as a har. of refuge Barroll *R & Eng* \* Dec -**91**
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- MEMPHIS imps. *E News* \* Nov 2-**89**

- Harbor, MONTREAL** imps. *E News* \* May 2-**91**; old revetment wall, Sproule *R & Eng* \* Dec, *R Gaz* \* Nov 18-**92**
- NANTES** port of *Eng* \* July 19, 26-**89**
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- New York, bulk-head construct. *E News* \* May 25-**89**; imp. of entrance, Edwards, dredging ap., inset \* Mar 19; masonry sea-wall, light-house station \* Dec 15-**92**; removal of obstructions, Hell-gate, abs. *Inst C E* v 93-**88**, \* Report Ch. of Eng'rs. U. S. Army -**86**; imp. *Sc Am Sup* \* Aug 25-**88**
- OTAGO** imp. Barr *Inst C E* v 110-**92**
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- PHILADELPHIA** port of, Haupt *F Inst* Jan, Mahan, Mar, Apr -**92**
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- POOLE** improvement *The Eng* May 8-**91**
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- ROCHELLE**, compressed air pier foundations, Thurninger, La Palice har., abs. *Inst C E* v 100-**90**, *An Ponts* \* Nov -**89**
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- ST. JOHN**, N. B., imp. and docks *E News* Apr 7-**88**
- ST. NAZAIRE**, France, lowering masonry shafts for quays, Mahan *E News* \* Oct 27-**88**
- SALTBURN-by-SEA**, works near *Eng* \* Mar 14-**90**
- SAN FRANCISCO**, water-front structures, Manson *E News* \* Dec 29-**88**; caisson used in founding sea-wall, R. Hunt \* Aug 2-**90**
- SCOTLAND**, N. and West coast piers and, Barron, inset *Inst C E* \* v 99-**90**
- SEA-walls, use of asphaltum in, Ambrose, and discuss. *Am C E* v 24-**91**, do. *E Rec* May 16-**91**; caisson used in founding, San Francisco, R. Hunt *E News* \* Aug 2-**90**; masonry, light-house station, N. Y. \* Dec 15-**92**; sinking foundation of by water-jet *E Rec* \* Mar 14-**91**; Scarborough, No. Cliff, and Royal Albert drive securing, Aytoun, insets *Inst C E* \* v 105 -**91**
- SWANSEA** port and dredging entrance channel, Capper *Inst C E* v 103-**91**

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**Launching**, ship, statics of, Baxter, abs. *Inst C E* v 110 -**92**, *U. S. Naval Inst* v 18 -**92**. See also SHIPS

**Law**, legal decisions, notes *E News* Oct 11-25, Dec 13, 20-**90**; public rights in private property, Fisher *St R J* May -**92**; evidence, accuracy, see OBSERVATION, average. See also ELEC Co.'s., Edison — lamp, incand. pats. decisions; MINING; PHOTOGRAPHY, the law and; PRICE regulating; SURVEYING

**Lead**, produc. and trade, '87 *E & Min* Jan 7-**88**, Jan 12-**89**; and copper cupolas, temp. in, and aluminate slags, Henrich, Dec 27-**90**; in '89, Jan 4-**90**, in, **90**, Jan 3; and zinc mining, U. S., Kirchhoff July 11-**91**; U. S. produc. '91, Jan 2; blast fur., cal. of charge, Hofman, bk. (full) Sep 3, 17-**92**

BONNE Terre, Mo., St. Joseph Co. dressing works, Munroe, insets (full) *Am Min* \* v 17 -**89**, (full) *E & Min* \* June 22, 29-**89**

**Smelting**, cast-steel water-jackets, note on, Terhune *Am Min* v 17 -**89**; Lewis & Bart. bag proc. of collecting lead fumes at Lone Elm works, Joplin, Mo., Dewey (full) \* v 18 -**90**, do. abs. *Inst C E* v 102 -**90**; roasting vs. fusing, Newhouse *E & Min* Feb 28-**91**; slag pots, Hofman \* Dec 31-**92**

**Leadville**, Col., geol. and mining indus., U. S. Geol. Survey monograph 12, Emmons, bk. review *E & Min* Apr 7, May 12-**88**

**Leather**, from tannery to dynamo, Schieren *El Eng*\* Mar 2, *St R J* Mar, *Sc Am Sup* Mar 19; elec. tanning, Worms & Bales' rapid proc. \* July 9-**92**, *Genie Civil*; leather-making (Am. Indus. development), Rich *Pop Sci* \* July -**92**. See also BELTS

**Leather**, Samuel P. *Inst C E* v 98 -**89**

**Ledger**, James C. *Inst C E* v 100 -**90**

**Lee**, Henry *Inst C E* v 97 -**89**

**Lee-Smith**, Hamilton *Inst C E* v 99 -**90**

**Le Mesurier**, Henry P. (full) *Inst C E* v 98 -**89**

**Length**, standards of, Bond *Soc Arts Mass* -**88**. See also WEIGHTS and measures

**Leslie**, Frederick *Inst C E* v 98 -**89**

- Leslie, Henry H.** *Inst C E* v 98-**89**
- Leslie, James** (full) *Inst C E* v 100-**90**
- Leveson-Gower, Granville G.** *Inst C E* v 104-**91**
- Lewis, H. C.** *F Inst Aug* -**88**
- Lewisohn, Leonard**, por. *E & Min* \* Oct 3-**91**
- Library**, indicator for books, n *E News* Jan 24-**91**; Nat., at Wash. *Sc Am Sup* Dec 31, of the U. S. (Libr'y of Congress), Spofford *Forum* Nov -**92**. See also BUILDINGS, library
- Lid**, annular, strains on resisting internal pressure, Rutherford *Am M E* \* v 10-**89**
- Life-boats**, Henderson's collapsible *Eng* \* Apr 12-**89**; models, expts., Corbett \* Apr 25-**90**; steam, Jan 23-**91**, do. 'Duke of Northumberland' *E News* \* Sep 27, do. *The Eng* \* Sep 5, 12, do. hydr. jet-propelled *Sc Am Sup* \* Oct 4-**90**; collapsible \* Aug 10-**89**; models, expts., Corbett (full) \* June 7-**90**. See also LIFE-saving
- Life-buoy**, the Franklin *Eng* \* Nov 20-**91**
- Life insurance**, life-expectancy rule *Locom* July -**86**; the expense margin in, Wills *Sc Am Sup* Jan 31-**91**
- Life-saving**, and salvage str. Aid, inset *Eng* Mar 4; U. S. Service, Piper *F Inst* Jan; devices, Woolven *Sc Am Sup* \* Apr 2, 16-30 \* May 14 \* July 2, 9, 23 \* Aug 20, 27 \* Sep 10 \* Oct 1, appliances \* Dec 10-**92**. See also LIFE boats—buoys; U. S. Life Saving Service
- Lifts.** See ELEVATORS; HYDRAULIC lifts
- Light**, photometry, personal error in, Nichols *El Eng* \* July -**89**, new photometer, do. \* May 28, do. *El Rev Lond* July 4-**90**; photometric research, R. C. Richards \* Mar 27 \* Apr 3 \* Sep 4-25, Oct 2, 9, 16-**91**
- El Rev* and color, Spice, Mar 30; and electricity, identity of, Herz, Dec 14-**89**; new photom. notes, Nichols, May 31; units of light and brightness, Weber, Sep 6; Varley's photom. \* Oct 18; artificial, of future, Nichols (full) \* Nov 29-**90**
- El Wld* photometry, personal error in, Nichols \* June 1-**89**; new photom., do. \* May 31; the Bolometric spectrometer \* June 21; artif., of future, Nichols (full) \* Nov 29, discuss. Dec 6-**90**; photometers \* Apr 25-**91**; Hering's portable photom. for st. lights and illum. \* Jan 16-**92**
- Eng* refraction goniometer, Trotter \* May 17-**89**; illum., distrib. and measurement of, do. *E News* \* Nov 24, do. and discuss. (full) *Inst C E* \* v 110-**92**; the ether-oxygen lime light,

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Ives *F Inst* \* Jan **88**; mod. conception of (full) *Locom* Nov **-90**

*Sc Am Sup* and color, Abney (full) \* Mar 2-23; optical torque, S. P. Thompson (full) \* Aug 10 \* Sep 21; mod. theory, Lodge, 28; effect on matter, Abney, Oct 5 **89**; the spectrum and its development, Yeo (full) \* Feb 1, 8; radiophony, Bell, May 10; artif. of the future, Nichols (full) Dec 13-**90**; optical projection *The Eng* \* Apr 22-**92**. See also COLOR; ELEC. light; GASEOUS illuminants; LIGHTING

**Light-houses**, Sautter, Lemonnier & Co's exhibit, Paris *Eng* July 19-**89**; illuminants, ed. Oct 31; stability, E. Schmitt, cor. *E News* \* Dec 6-**90**; fog or dipping ap. for elec. light in, Stevenson, inset *Inst C E* \* v 92-**88**; French, n *R & Eng* \* Apr -**90**, *Genie Civil*; oils, Edwards (full) *Sc Am Sup* Mar 19; lens (large), Wigham, June 11, do. *The Eng* Apr 22-**92**; elec., Scand. exhib., Copenhagen, Nov 9-**88**; Douglass \* Mar 29-**89**. See also Wave pressure on structures

BISHOP'S Rock and Tory Is. *Eng* Feb 26, Douglass, illum. by gas, Salmond, discuss., insets *Inst C E* \* v 108-**92**

BULL Rock, So. Coast Ire. *Sc Am Sup* \* Oct 5 *The Eng* Aug 23-**89**

CAMPEN and illum. of Lower Ems, Riensberg, abs. *Inst C E* v 103-**91**, *Zeit deut Ing* -**90**

DIAMOND Shoal, Outer, Cape Hatteras, N. C., proposed *E News* Oct 5-**89**, inset \* July 26, 26, Aug 2, inset \* 9, *R Gaz* May 30-**90**

EDDYSTONE model, Naval exhib., Lond *The Eng* \* Apr 10-**91**

FINLAND, recent, Strukel, abs. *Inst C E* v 110-**92**, *All Bauz* -**92**

GIBB's Hill cast iron tower, Bermuda *R & Eng* \* Feb -**89**

HATTERAS light contract, ed. *E News* May 31-**90**. See also LIGHT-house, Diamond

MEW Is., Dublin, Griffith, insets *Inst M E* \* July -**88**

OLD Orchard Shoal, N. Y. harbor *E News* \* Feb 6, *R & Eng* \* Mar -**92**

OYSTER Is., Burmah *The Eng* Sep 13-27-**89**

ST. Catherine's Point, Isle of Wight, most powerful light in world, Douglass *Sc Am Sup* \* July 21 *The Eng* June 15-**88**

**Lighting**, artif. illum., effic. of methods, Nichols (full) *El Rev Lond* \* Apr 12, 19, do. (full) *El Wld* \* Mar 30, do. abs *Inst CE* v 97-**89**, do. (full) *El Eng* \* Apr -**89**; artif. of future, do. (full) \* Nov 26-**90**; elec., relation to optical science, Boyle (full) *El Wld* \* Nov 14-**91**; compressed oil-gas, Ayres *Eng* Apr 13-**88**; the Wells system *E News* \* Aug 10-**89**; illum. and ventil., Lewis *E Rec* Jan 11-**90**; Welsbach system, Graniger *F Inst* \* May -**88**; developments in artif. illum., Morton *Sc Am Sup* Mar 16-**89**; by compressed oil-gas \* July 26-**90**; Harcourt's Pentane standard lamp, Clifford *Tech Q* May -**90**. See also ELEC. lighting; Gas-lighting; LIGHT

**Lights**, st. and illum., Hering's portable photom. for *El Wld* \* Jan 16-**92**; contractor's portable *E News* \* Nov 16-**89**; the ether-oxygen lime light, Ives *F Inst* \* Jan; the Lucigen, econ. illum. from waste oils, Hannay *Sc Am Sup* \* Jan 14; floating, 8-ft. cyl. lanterns *The Eng* Nov 9-**88**. See also ELEC. lighting and lights

**Light-ship** No. 5, with elec. lights, U. S. *R & Eng* \* Aug, abs. *Inst CE* v 106 -**91**

**Lightning** *El Eng* Varley Sep-Dec -**88**; arresters and photog. study of self-induction, Acheson (full) \* Feb; conductors and arresters, Brit. Assoc. discuss. Apr, May -**89**; arrester, Westinghouse \* Apr 9; the Wirt arrester \* May 7; conductors, Lodge, July 2-**90**; protection, Hodges \* Feb 11, Hubbell, June 17-**91**; arresters and discuss. of non-arcing metals, Wurtz (full) \* Mar 23-**92**

*El Rev Lond* Varley, July 20 - Oct 12, Nov 2, rotary motion, Parker, Dec 14-**88**; arresters and self-induction, Acheson \* Feb 1, 15; Lodge (full) May 3-24 \* June 6-20; conductors, Varley, July 5 \* 19, Aug 9, Oct 4, 18-**89**; connection, Fischer, Jan 24, 31, Feb 7; Mar 14-28; Apr 4, 11; conductors, Varley, May 24, 31, June 7-21; thunderstorms, Hazen, Aug 15: protection of buildings, Bennett, Oct 10-**90**; damage, curious case, Hands, Jan 8, protection, do. Feb 19-**92**

*El Rev* peculiar motions of, Parker \* Nov 24-**88**; arresters and self-induc., Acheson (full) \* Jan 19-**89**; arresters and discov. of non-arcing metals, Wurtz \* Mar 26; rods, McAdie, Sep 17-**92**

*El Wld* protection of elec. light stations, Jenks (full) \* Aug 18; rotary motions in, Parker, Nov 24-**88**; arresters and self-induc., Acheson (full) \* Jan 19, Brown, Child \* Feb 23-**89**; Lodge's protectors (wires) \* May 17; and the elec. spark, Bid-

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well \* July 19-**90**; rods, E. Thomson, June 27-**91**; caprices, Hering \* Jan 16; arresters and discov. of non-arcing metals, Wurtz (full) \* Mar 26 \* Apr 2, 9-**92**

*Eng* protection from, ed. Aug 3 \* Sep 7; conductors, Brit. Assoc. pro. Oct 19, 26; flashes \* Dec 21-**88**; rods, E. Thomson *E Rec* July 11-**91**; Jove's autograph, Jennings, insets *F Inst* \* Jan -**92**; conductors, Kohlrausch, abs. *Inst C E* v 93 -**88**; do., connecting with water and gas pipes, Weber, abs. v 95 -**89**; conductors, Frisch report *Sc Am Sup* Jan 26; discharge, influence of gas and water pipes, Wilde, Aug 3-**89**; protection of chimney shafts, Molyneux, Wood, Apr 19-**90**; rod protection, Hodges, Apr 18-**91**; peculiar rotary motion of and elec. curs., Parker \* *Soc Arts Mass* -**89**

**Limberg**, Charles T., por. *E & Min* \* Apr 25-**91**

**Limestone** industry, Day *Sc Am Sup* July 25-**91**

**Lime** sulphite fibre manuf. in U. S., Michaelis and discuss., chem. of the processes, Griffin *Am C E* \* v 20 -**89**, do. (full) *Sc Am Sup* Jan 11-25-**90**

**Lindley**, Robert C. *Inst C E* v 92 -**88**

**Linnæus**, por. *Sc Am Sup* \* Feb 18-**88**

**Liquids**, self-acting, measuring ap., Monte-jus *Eng* \* Dec 12-**90**; compressed, dilatation of, Amagat *F Inst* Sep -**89**; heating and concentrating by steam, Hudson *The Eng* Apr 11, 18 \* May 23 \* June 6, 13-**90**

**Liquors**, aging, Turner's ap., Ramsay's proc., Stauffer *Sc Am Sup* \* Sep 10; and preserves manuf., Brevans \* Nov 19, 26 \* Dec 3-31-**92**, etc.

**Liverpool**, works at *Inst M E* July -**91**. See also under DOCKS — WATER-works, etc.

**Locomotives**, Catechism of the Locomotive, Forney, bk. (very full) *R & Eng* \* Jan -**88** - Oct -**89**; effic. of, Dixon *Am M E* \* v 11 -**90**; econ. of the, Bell *El Wld* May 24-**90**; practice, ed, *Eng* June 29-**88**; express pass., Paris exhib., inset \* July 5, do. ed. 26, Aug 2, 9; Brit., cost of working, table, Nov 8-**89**; tank express double bogie, Brunner, cor. \* Sep 26-**90**

*E News* oscillations registering ap. Feb 8; frt., for So. Am. (meter gauge) \* May 17; effic. of, Dixon, Aug 16-**90**; of world, n Oct 20-**92**; vibratory movements of and on timing trains and testing R. tracks, Milne, discuss., insets *Inst C E* \* v 103 -**91**; speed and power, Hill \* v 109-**92**; shipping at high

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speed *Locom* July, *R Gaz*; of future, n *R & Eng* Feb -**88**; problem, Apr \* July -**92**

*R Gaz* marine practice and locom. construct., ed. June 15; road foreman (duties), Oct 12; cost of rebuilding, 19-**88**; proportions, cor. (full) Apr 26; Paris exhib. \* July 19, Aug 16; coal consumption as affected by enginemen, Baker, Aug 2, 30; R. I. works and Schenectady heavy express \* Oct 25-**89**; effic., Dixon and ed. May 23, 23, ed., June 13; minimum curvature, ed. \* Oct 3-**90**; free steaming, essential qualities, Mitchell, Jan 23; wheel wts. of heavy, Kruttschmitt \* May 22-**91**; power, suburban pass. trains \* June 10-**92**; waters for, Gibbs *Steven's Indic* July 15-**88**

*The Eng* cost of parts in U. S. Jan 13; single vs. coupled, Apr 13; express, designs, cor., Nov 23; engine resistance, ed., Nov 16, 16, Dec 7-**88**, *E News*; repairing, Barker *The Eng* Feb 21; speed, ed. May 30; how propelled, cor. \* Oct 31-**90**; mod. construct. \* Jan 1, 8 \* Feb 5, Apr 22 \* May 6, 20 \* July 8, (brass foundry) Oct 21 \* Nov 4 \* Dec 30-**92**

ABT, Manitou & Pike's Peak R. *R Gaz* \* Feb 6-**91**

AIR-pump governor, Barnes', Wabash R. *The Eng* Oct 19-**88**

AMERICAN, in New So. Wales *E News* July 21, Aug 18 \* Sep 22; and English, wts. comparison, Purdon, Oct 20; exhib., Dec 22-**92**, *Industries*; and English, speeds *Locom* July -**89**; and English, eds. *R & Eng* July - Dec -**90**, eds., May, Aug, Nov, Dec -**91**, Jan, tables (full) Feb, (full) June, Aug -**92**

*R Gaz* in New So. Wales, cor. June 1-**88**; and English, ed. Apr 25, (full) May 9-**90**, Dean, July 10, relative merits, Forney (full) Nov 27-**91**, *R & Eng*, (proportions), table, ed. *R Gaz* May 6-**92**; practice in Am. *Sc Am Sup* \* Nov 23-**89**

*The Eng* Am. practice \* May 3 \* June 21, July 19, 26, Sep 6-**89** \* Jan 3, 31 \* Feb 28 \* June 6 \* Oct 17, and English, ed. Nov 7-**90**, trials, ed. Feb 27, vs. English, Dean, and ed. July 24, 24-**91**, Feb 26, Mar 4, 11, exhib. of, Apr 1, May 27-**92** AM. Master Mechanics' Assoc. reports *R & Eng* July -**90**, pro (full) *R Gaz* June 19, 26-**91**, *The Eng* July 12-**89**. See also RAILROADS, Master Mechanics

BALDWIN, works erecting shop *R & Eng* \* Dec -**90**; No. 10,000 *R Gaz* \* Sep 27-**89**; Erie, 10-wheel express, inset \* June 13-**90**; varieties built, June 5-**91**; in New So. Wales (full) July 15, Aug 19, *The Eng* July 1, Sep 23-**92**

- Locomotives, BALT.** & Ohio, consol. *R Gaz* \* Aug 2, 30; pass.  
 \* Sep 6-**89**; 10-wheel, tests, ed. (full) \* Nov 27, 27 \* Dec 11  
**-91**; 6-wheel switcher, inset \* July 22-**92**
- BELGIAN**, State R's, express pass., Paris exhib. *Eng* July 5, 5,  
*The Eng* \* May 3, 31, 31-**89**; goods, Paris exhib. \* Jan 24-**90**  
**BELL-ringer**, steam *R Gaz* \* Mar 8-**89**; White's pneu. \* Aug 8  
**-90**
- BENGAL** & No. W. R., India, and rolling stock, Rhind, insets *Inst  
 CE* \* v 91 -**88**
- BLAST**, pipe, influence of intermediate tuyeres, Fliegner, abs. *Inst  
 CE* v 91 -**88**, *Schweiz Bauz* Nov 5-**87**; nozzle, Adams'  
 variable *R & Eng* \* Oct -**90**, *Eng*; pipes, Kordina's vortex  
*The Eng* Jan 20-**88**
- BOILERS**, strains in, Randolph *Am ME* v 9 -**88**; imps. in construct, Hickey *E News* \* Apr 4-**91**; construct. and effic., Sheffield *Inst CE* \* v 109 -**92**; *Locom* Nov -**88**; ed. *R &  
 Eng* Oct -**88**; without stay-bolts, Bork \* May; expts. with, rate of combust., B. & O., temp. in smoke-boxes, Wells, ed. \* Aug -**90**
- R Gaz* water circulation, Hackney, Dec 28-**88**; grate areas proportions, ed. Apr 5; tubes length, ed. Nov 15; tube and rivet table, for spacing, Dec 27-**89**; C. B. & Q. experimental \* Jan 3; Leach, N. E. R. Club discuss. Apr 11; expts. with tubes of varying length, Paris, Lyons & Med. \* July 4-**90**
- R Gaz* stay-bolts, N. E. R. Club discuss. Mar 20; construct. imps., Hickey \* Apr 3; incrustation, treatment of waters used, Barr, Nov 13, discuss. Dec 4-**91**; stay-bolts in, Cole \* Jan 8; steel plates specs., Eastern R. of France, Feb 19; Phil. & Reading express, inset \* Mar 18; care of, in Algeria, Bates \* July 22 \* Aug 19; scale and feed water purification, Sep 30-**92**; Dean *Sc Am Sup* Feb 20-**92**, *Nat Car and Lo Bldr*
- The Eng* Leach's flexible stays, Feb 10-**88**; steel, Lond. & N. W., Webb \* Oct 18 \* Dec 6-**89**; experimental (compound tubular), Chemin de fer d l Est, France \* Nov 13-**91**; construct. \* Jan 1, 8 \* Feb 5; Leahy, cor. \* Apr 22; double, Eastern R., France \* Mar 4, 11; Great Western, converted \* Oct 21, 28-**92**
- ALTOONA** and Penn shops, notes, ed *E. News* Apr 26-**90**
- BELPAIRE**, and the radial stay, and ed. *R Gaz* \* Aug 1, cor. \* Sep 26, 26-**90**; 62-in., Ill. Cen. \* Nov 20-**91**
- CLEANER**, the Trowbridge *R Gaz* \* Jan 17-**90**

- Locomotives, Explosions**, remarkable, Atlan. & Pac. *E News* \* Jan 14-**88**; remarkable, Norwegian State R's \* June 7-**90**; on Brit. R's *R & Eng* \* Jan-Apr -**88**; in Europe *R Gaz* \* Jan 18-**89**; in France and Algeria *The Eng* Aug 31, 31-**88**, in France since 1840 *An Indus* July 29-**88**; France, Belgium, Holland and England *The Eng* Jan 11 \* Feb 1, 22-**89** FIRE-boxes, the Darby crown sheet. Grand Trunk R., Can. *Eng*\* Aug 24-**88**; Webb's \* May 17, 17; corrug. steel, Lond. & N. W., Webb \* Aug 23-**89**; the steam-jet as a means for preventing smoke *E News* \* Apr 4-**91**; ed. *R & Eng* Jan; corrug. tubular, Knaudt, abs. June; fire-brick lined (full) \* Oct, Phelps, cor. Nov -**89**; corrug., Lentz, Apr-**90**; Forney's door opener \* June; corrug. \* Sep -**91**
- R Gaz* and coal burning, Higginson, and ed. July 20-**88**; Master Mechanic's com. report, June 27-**90**; staying, Woods, Apr 17; Hawksworth's door opener\* May 1; Ten Brinck fuel saving tests, Orleans R., France \* 8, 22-**91**, *Ing Civils*; Webb's steel *The Eng* \* June 14-**89**
- JOHNSTONE compound *R Gaz* \* May 27-**92**
- KNAUDT & Pohlmeier's, Prussian State R's *Eng* \* Oct 4, *R Gaz* \* Nov 15-**89**
- LENTZ'S stayless *Eng* \* Dec 19, *R Gaz* \* Apr 4-**90** \* Jan 9 -**91**
- SPEIRS' construct. *E News* Jan 23, Dean, 30, (full) *R Gaz* Jan 22-**92**
- WOOTTEN, U. Pac. express pass. *R Gaz* \* June 15 \* July 6-**88**
- BOSTON & Albany 4-wheel switching *R & Eng*\* Nov, Dec -**91**
- BRAKE gear diags., Am. Brake Co., cor. *E News* \* Jan 26-**89**
- BRISTOL & Exeter express *The Eng* \* May 9, 9-**90**
- BUILDING, Am., '88, n *Eng* Mar 8-**89**; in New So. Wales, June 6-**90**; in '89 *E News* Feb 1; 40 years' course of, French, inset *The Eng* \* June 20, July 18-**90**
- CAB, Balt. & Ohio *R Gaz* \* Dec 16-**92**
- CALEDONIAN R. bogie pass. *The Eng* Apr 13, 13-**88**; No. 123. performance, diags. \* Mar 13-**91**
- CANADIAN Pac. 10-wheel heavy pass., inset *Eng* \* Jan 17, inset *E News* \* Aug 30-**90**; mogul, inset *R Gaz* \* May 31, inset *The Eng* \* June 21-**89**
- CAPE Gov't. R's, coal burning of Colonial coal on, Stephens. insets *Inst M E* \* Jan -**90**
- CAVAN R., light locom. *The Eng* Apr 20, 20-**88**

## 214 LOCOMOTIVES. CHESAPEAKE — COMPOUND

**Locomotives, Chesapeake & O.** 10-wheel pass., Rogers works  
*R & Eng*\* July -90; tank switching, 2500 gals. *R Gaz* \* July  
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**CHICAGO**, Bur. & Q. pass., inset *E News* \* June 28; standard  
mogul \* July 5-90; suburb. pass., inset, ed. *R Gaz* \* Dec 13-  
89; 75-ton decapod, Rogers works, inset \* July 24-91

**CHICAGO**, Mil. & St. P. express *R Gaz* \* Feb 20, details\* Mar 6-91

**CLEVELAND**, Cincin. Chic. & St. L. *R Gaz* \* Jan 1-92

**COALING** chutes *R Gaz* \* Dec 11, 18-91; coaling stations, Berg,  
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**COMPOND** *Eng E.* Worthington, Jan 11; Lapage \* Mar 22, 29 \*  
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*E News* Apr 20; Am. \* Nov 30-89; Am. Master Mech's com.  
report, and ed. June 28, 28-90

*E & Min* compounding petrol. refuse burning, Russia,  
Urquhart, abs. Sep 14-89, insets, discuss. (full) *Inst M E* \* Jan  
-90; Lapage, discuss., insets \* Jan -89; the compound principle  
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Civils* Oct -90; relative value of different types, abs. *Inst C E*  
v 106 -91, *Am Mas Mech* 24th report

*R & Eng* 4-cyl., Bousquet, and ed. \* Mar -89; Master  
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Mallet (full), Feb, ed. \* Mar - June -91; Webb, Jan;  
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*R Gaz* in Am. service, ed. \* Feb 15, 22; Sinclair, N. E. R.  
Club discuss. Apr 19; May 10; starting power of, Neale, cor.  
Aug 16; Barnes, discuss. Oct 18; India, Hughes \* Nov 22; ed.  
\* Dec 20-89; mathematics of, French, Mar 7; Polonceaux, Apr  
18; Master Mech's com. report, June 27; early, Perry & Lay \*  
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*R Gaz* pats. on (list), Feb 13, English \* 20; braking power  
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Master Mech's discuss. \* June 26; cyl. proportions, Oct 2; U. S.,  
table, Dec 18-91; in frt. and pass. service, Woods, Jan 1; trip-  
expan. n May 13; three-cyl. \* Dec 30; Master Mech's com.  
report, abs. July 1, (full) *Ry Age* sup. June 24-92

*Sc Am Sup* compound prin. applied to locoms., E. Worthington,  
Mar 30-89; steam distrib. in, Snow \* May 10-90, *R Mas  
Mech*; comp. prin., Worthington *The Eng* Jan 25-89; cyls.  
Harrison, cor. \* June 6-90; Rickie, cor. Oct 23-91

- Locomotives, Compound, Argentine** Great Western, burning liquid fuel *The Eng* \* May 15-**91**  
 ARGENTINE Midland R. *The Eng* \* Dec 27, 27-**89**  
 AUSTRALIA, Baldwin, tests of Vauclain (full) *R Gaz* May 29 \* Aug 7-**91**  
 BALDWIN four-cyl. and ed. *R Gaz* \* May 2, 2-**90**; \* May 1, table, Nov 27-**91**. See also LOCOMS., comp., Balt.  
 BALTIMORE & O., Baldwin, details, inset *E News* \* May 3, 3, tests of and ed. Sep 6 \* 13, 13, narrow-gauge \* Dec 13; tests, Barrus (full), and eds. Sep 12, 12, 19 *The Eng* \* Sep 19, 26-**90**  
 BATCHELLER'S pat. valve *R & Eng* \* May; R. I. Locom. works, Franklin Inst. medal *R Gaz* June 3-**92**  
 BROOKS two-cyl. *R Gaz* \* Nov 25-**92**  
 CHICAGO Mil. and St. P. tests, inset *R Gaz* \* Aug 5, 5-**92**  
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 EAST Tenn. Vir. & Ga. indic. diag. *E News* \* Nov 22-**90**; ten months' test of, Dec 5-**91**  
 FRENCH *R & Eng* \* Aug -**89**; recent *R Gaz* \* Jan 3-**90**  
 GERMANY, in, Stambke *E News* \* Apr 19, May 3-**90**  
 GRAZI-Tsaritsin R. goods, petrol. refuse, Urquhart *The Eng* \* Jan 31-**90**  
 HUNGARIAN State R's *E News* \* Feb 6-**92**  
 JOHNSTONE's double truck, Mex. Cen. *E News* \* Aug 29-**91** \* Mar 12-**92**; abs. *Inst C E* v 106-**91**; Mex. Cen., tests (full) *R Gaz* \* May 22, 29, Oct 9; 10-wheel, inset \* June 5; trials anal., cor. Sep 25-**91**; double bogie, Mex. Cen., inset \* Mar 25, test \* Aug 26 (full) \* Dec 30, 30-**92**. See also LOCOMS., comp., Mex. Cen.  
 LAKE Shore & Mich. So. frt. *R & Eng* \* Dec -**92**  
 LINDNER's starting gear, system for *E News* \* June 16, do. *R & Eng* \* Dec -**92**, do. *R Gaz* \* Nov 15-**89**; do. in Russia \* Mar 18, 27-**91** \* Sep 2-**92** *The Eng* \* May 23-**90**  
 LONDON & No. W., Edinb. exhib., inset *Eng* \* July 25-**90**; Webb's, with Joy valve gear *E News* \* Jan 26-**89**; frt. *R & Eng* \* Feb; Webb's *The Eng* Dec 21, 21-**88**  
 MALLET'S, Decauville R., Paris exhib. *Eng* \* May 3, do. *E News* \* June 1-**89**; largest and smallest *R Gaz* \* Aug 15-**90**; prog. in use of \* Feb 6, arguments pro and con, Poloncneau, 13-**91**, *Ing Civils*; Paris exhib. *The Eng* \* May 24-**89**

- Locomotives, Compound**, MEYER-Lindner duplex, Roy. Saxon St. R. *R Gaz* \* Sep 2-**92**
- MEXICAN Cen. 10-wheel Johnstone's double truck, inset *E News* \* Aug 29-**91** \* Mar 12, inset (full) \* 26 \* Apr 2, valve motion \* **9-92**; Johnstone, tests *R & Eng* \* June, n Aug -**91**, Nov -**92**, do. *R Gaz* May 29, Oct 9-**91**, test \* Aug 26-**92**
- MEXICAN National R., dimens., news n *E News* Dec 13 -**90**
- MICHIGAN Cen., Schenec. works *Eng* \* Apr 4-**90** *E News* Jan 25, and ed. \* Mar 8-**90**; ed. *R Gaz* \* Jan 31, ed. Feb 14-**90**; 10-wheel pass. \* Jan 23-**91**
- MISSOURI, Kan & Tex., and simple, comparative tests *R Gaz* Nov 11-**92**
- NORTH Eastern R., England, express, Worsdell, inset *Eng* \* Mar 30 \* Apr 13-**88** \* June 21, 21-**89**; pass do. *R & Eng* \* May -**90**; tank engine *The Eng* Oct 26, 26, goods tank, Nov 23, 23-**88**; express, inset \* Feb 28 \* Mar 7-**90**
- NORTHERN R. of France, goods, Paris exhib., inset *Eng* \* Dec 6-**89**; 4-cyl. fast pass., Bousquet, n *R & Eng* Jan \* Aug *R Gaz* \* Aug 12 *The Eng* \* Sep 2-**92**
- PARIS, Lyons & Med. R. *The Eng* \* Aug 9-**89**
- 'PENN,' the *R Gaz* \* May 3-**89**
- PITKIN'S pat. *R & Eng* \* Mar -**90**
- PRUSSIAN State R's, goods, Worsdell system, inset *Eng* \* Feb 1-**89**
- RHODE Is. Locom. works, com. report, insets (very full) *F Inst* \* May -**92**; Batcheller, bk. review *R & Eng* Jan -**91**; test in express service, Jan -**92**; and simple, study of, expts. *R Gaz* \* Jan 9; system of (full) \* Dec 11-**91**
- RUSSIA, petrol. fuel, Urquhart *Eng* Feb 7 \* 21 \* Mar 7, do. *E News* \* June 14-**90**
- ST. Gothard R., duplex *E News* \* Aug 15-**91**
- ST. Petersburg & Warsaw R., pass., inset *Eng* \* Sep 9, *R & Eng* \* Nov -**92**
- SAXON State R's express, dimens. *R Gaz* \* Nov 22, 29-**89**
- SOUTHERN Pac. *E News* \* Apr 28-**92**; 10-wheel, inset *R Gaz* \* Sep 11-**91**
- SWISS, Jura-Berne-Lucerne R., pass. mogul, inset *Eng* \* Feb 7; *R Gaz* \* Sep 12-**90**
- TESTS, Baldwin, Balt. & O. and ed. *E News* \* Sep 6, 13, 13; Union El. R., Brooklyn, in fast pass. service, Dec 27-**90**

**Locomotives, Compound, Tests**

\* Jan 3; 10 months, E. Tenn. Vir. & Ga. Dec 5, 12-**91**; Vauclain \* June 23, ed. 30, 30, indic. diag. \* July 7-**92**; Johnstone, Mex. Cen. R & Eng \* June \* Aug; W. N. Y. & Pa. R. Oct -**91**; R. I. works, in express service, Jan; Johnstone, Mex. Cen. Nov -**92**

*R Gaz* B. & O., Barrus, (full) Sep 12, 19-**90**; R. I. works expts. \* Jan 9; Johnstone's (full) \* May 22; Vauclain, May 29, \* Aug 7; Johnstone, trials anal., cor. Sep 25; and simple, comparative, W. N. Y. & Pa. Oct 2, Baldwin, Mex. Nat. Dec 4-**91**; Johnstone, Mex. Cen. \* Aug 26; and simple, comparative, Mo. Kan. & Tex. Nov 11-**92**; comparative, Hudson *Sc Am Sup* Jan 23-**92**, *J Assoc E Soc*s; B. & O. *The Eng* \* Sep 19, 26-**90**

VALVE gear, variable expansion, Dunlop, cor. *Eng* \* Feb 13-**91**; for Hope & Co., cor. *R Gaz* Sep 19-**90**

VAUCLAIN, 4-cyl. *E News* \* May 3-**90** \* Feb 20; tests \* June 23, ed. 30, 30, indic. diag. \* July 7-**92**; com. report *F Inst* \* July -**91**; patent, n *R & Eng* Jan -**90**; tests *R Gaz* May 29, Australia, Baldwin, tests \* Aug 7-**91**; Manitou & Pike's Peak rack R., n \* Aug 12-**92**

VON Borries', starting valve for (full) *R Gaz* \* June 12-**91**. See also LOCOMS., comp., Worsdell & Borries

WEBB'S, Lond. & N. W., with Joy valve gear *E News* \* Jan 26, *Eng* \* June 7-**89**, *The Eng* Dec 21, 21-**88**

WOOLFE 4-cyl. double-expan., ed. (full) *R Gaz* \* Mar 8, 8-**89**

WORSDELL, N. E. R. express, inset *Eng* \* Mar 30 \* Apr 13-**88**; Worsdell & Borries' system, goods, Prussian State R's, inset \* Feb 1; N. E. R. express, inset \* June 21, 21-**89**, do. *R & Eng* \* May -**90**; applic. to Am. type of locom. *R Gaz* \* Dec 14-**88**; Grand Trunk R. \* Nov 6-**91**; Bengal R. *The Eng* July 20-**88**

WRIGHT'S *R Gaz* \* Jan 30-**91**

COMPRESSED air, 40 and 50 ton, Mekarski system, for Paris, France *E News* \* May 31-**90**. See also STREET railroads, compressed air motors

CONNECTING rods, side rods, N. W. R. Club discuss. *R Gaz* Nov 21-**90**; and crank pins, Chic. B. & Q. R. \* Jan 16-**91**; parallel rod resistance, Apr 8-**92**; *The Eng* May 25, June 22-**88**

- Locomotives, COUNTERBALANCING**, recip. parts, Lanza *Am ME* \* v 10-**89**; W. H. Lewis *E News* \* Apr 26-**90**; eds. *R & Eng* \* Feb - Apr -**90**; Hill *Inst CE* \* v 104 -**91**; Lanza *R Gaz* \* Oct 19-**88**; Booth, cor. \* Oct 11-**89**; in 3-cyl. compound, cor. and ed. \* Mar 21, review of, 21, Booth, cor. and ed., Apr 4; W. H. Lewis \* 25; Western R. club discuss. May 30-**90**, Barr discuss. do. \* Mar 6-**91**; expts. on methods, Lanza *Tech Q* \* Feb-**89**
- CRANK**-pin turning machine, Urquhart *Eng* \* Apr 12; at Paris exhib. \* Sep 27-**89**
- CRANK** shaft, expts. with, Ivatt *R & Eng* \* July -**91**, steel, test of, do. *The Eng* \* Apr 8-**91**
- CYLINDER** cock, Riggins combination *R Gaz* \* July 4-**90**
- CYLINDERS**, design, Barker, inset *Inst CE* \* v 106 -**91**; steam action in at high speeds, ed. *R Gaz* Nov 22-**89**; proper capacity for pushers on grades, ed. \* Dec 19-**90**; means for increasing power at speed, ed. Oct 23-**91**; and slide valves, Lond. Br. & So. C. *The Eng* Aug 23-**89**
- DELAWARE**, Lack. & W. mogul frt. *R Gaz* \* Feb 3-**88**
- DOUBLE** end saddle tank, Porter *R Gaz* \* June 14-**89**
- DOWNWARD** draft, Complete Combustion Co. *E News* \* Aug 2 -**90**
- DRIVING**-box linings, opinions, table *R Gaz* Mar 28-**90**
- DRIVING-wheels**, 'imperceptible slip,' Sargeant, C. B. & Q., tests of, table *E News* June 14; ap. for removing paint from, Horton \* Oct 11-**90**; Vauclain's centers, com. report *F Inst* \* July -**91**; big *R & Eng* Nov -**92**; size of express, ed. *R Gaz* Oct 26-**88**; 7½-ft. cast steel, N. E. R., England \* Mar 7-**90**; Vauclain's wrt. iron centers \* July 10-**91**; best size of, Greenhill *The Eng* Mar 29-**89**; polygonal \* Apr 4-**90**
- DRIVING-wheel** tires, Bess. steel, Arnold *Eng* Dec 7-**88**; wear of, cyl. wheels and flat-topped rails, Whittemore *E News* \* Feb 9, and ed. 16, 16, 23, ed. Mar 2; tests, Mich. Cen. \* May 11-**89**; retaining ring for \* July 19; hollow, dangers of in contact with frog points, Perry \* 26; breakages in Germany, Aug 9; steel, and attaching do. with different fastenings, Rhodes, Nov 8 \* Dec 6-**90**; irreg. wear of, Barr \* Feb 7-**91**, do., Herr \* June 16-**92**
- Inst CE* and rails wear on curves, Helmholtz, abs. v 93-**88**; Bess. steel, influence of chem. composition on strength, Arnold, discuss. \* v 95 -**89**; oil-gas tire setting ap., G. T. R., Wanklyn.

**Locomotives, Driving-wheel tires**

abs. v 104-**91**; and axle specs., English *R & Eng* \* Aug; German fastenings \* Aug -**91**

*R Gaz* wear of, table, Master Mech's com. rep. June 22-**88**; steel, influ. chem. compos. on strength, Arnold, Mar 8-**89**; steel and Ross-Meehan shoe, N. E. R. club discuss. Oct 17; steel, attaching to center, Rhodes, Nov 7, fastenings, do. \* Dec 5-**90**; irreg. wear of, Barr \* Feb 6; wear, flat spots on \* Mar 20; steel, tests, Roussel \* Apr 3-**91**; stresses in, cor. Jan 22; irreg. wear of, Barr \* June 17; shrinkage of, table, July 15; wear, Herr, discuss. \* Oct 21-**92**

EASTERN R. of France, tank, Paris exhib., inset *Eng* \* Aug 30 \* Sep 20-**89**; Flaman boiler (compound), inset \* Mar 25 \* Apr 8, 22; fast *R & Eng* \* Mar -**92**; express experimental *The Eng* \* Nov 13-**91**; double-boiler express, inset \* Mar 4, 11 -**92**

ELECTRIC, Manhattan Elevated R., and steam, comparative tests, Moss, insets *Am C E* \* v 23-**90**; A. Siemens *El Rev Lond* \* Aug 12, do. results, City & So. Lond. R. *Eng* \* Aug 19, do. *E & Min* \* Sep 3-**92**; and steam, compar. tests, effic., Moss *E Rec* July 19, do. *The Eng* Aug 29, do. and ed. (full) *R Gaz* \* July 11, Moss, cor. 18-**90**; Weem's high speed, expts., Crosby (full) Mar 13-**91**; as substitutes for steam locoms., Woods, June 24-**92**; Daft, trial, N. Y. El. R. *Sc Am Sup* \* Mar 2-**89**

ENGINE drivers, hours of *Eng* Jan 30-**91**

ENGLISH, and Am. and ed. *E News* Aug 2, 2, discuss. Oct 11-**90**; use of truck on *R & Eng* \* Aug; express, Paris exhib. \* Nov -**89** *The Eng.* See also LOCOMS., Am. and English—erecting

ERECTING *Eng* \* Dec 18-**91**; English *R Gaz* \* Sep 28; at Altoona *The Eng* Sep 28-**88**

ESTRADE's high-speed, Paris *Sc Am Sup* \* Apr 28 *The Eng* Mar 9, 9-**88**

EXHAUST, nozzle, Macallan's variable *Eng*\* Aug 22-**90**; muffler. Penn. R. *E News* \* July 21-**88**; pipe, Smith's triple-expans. Mar 16-**89**; pipes, nozzles, etc., Am. R. Master Mech's report \* June 20-**91**; nozzles, single and double, ed. *R Gaz* \* May 16 -**90**; pipes report \* June 19; nozzle, Mertsheimer's variable \* July 31-**91**; ap., common sense about, ed. \* June 17-**92**

FAIRLIE system, Mex. Cen., inset *Eng* \* Mar 14-**90**

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- Locomotives, Feed** water heater and purifier, Barnes' *E News* \* Aug 9 *R Gaz* \* July 25-**90**; purification, Northwest R. club discuss., C. N. Hunt, Dec 13, 20-**89**
- FIRE-boxes, brick arches in, Am. R. Master Mech's com. report *E News* Aug 9-**90**. See also LOCOMS., boilers, fire-boxes
- FIRE extinguisher, Penn. R. *R Gaz* \* July 19-**89**
- FREIGHT, hauling capacities, table *R Gaz* Nov 21-**90**
- FRENCH, Paris exhib. *R & Eng* \* Nov, pass. \* Dec -**89**; tank \* Feb -**90** *Eng*; notes *R Gaz* \* Jan 16, 23-**91**; Chemin de fer d l'Ouest, express *The Eng* \* Oct 4, 11-**89**. See also LOCOMS., Eastern R. of France
- FUEL, premiums, Russia, Borodine *R Gaz* Sep 27-**89**; Yates' mileage card, Aug 1-**90**; petroleum, liquid fuel on *Eng* \* Oct 19-**88**, working of, Urquhart \* Feb 8, 15-**89**, do. tests *E News* \* Feb 2-**89**, burning \* Aug 25-**92**, do. Dudley *F Inst* \* Aug -**88**, in So. E. Russia, Grazi & Tsaritsin R., Urquhart, discuss., insets *Inst M E* \* Jan -**89** *R & Eng* \* Jan -**89**, on Great Eastern R., England, Booth *R Gaz* \* Feb 26-**92** *Sc Am Sup* \* Nov 24-**88**, working with, Urquhart (full) \* Sep 27 \* Oct 4-**90**. See also LOCOMS., boilers, liquid fuel
- FURNACE coal burning, Higginson *R Gaz* \* Nov 23-**88**. See also LOCOMS., boilers, fire-boxes
- GEORGIA Pac., 10-wheel *E News* \* Apr 5-**90**
- GLASGOW & So. West., pass., inset *The Eng* \* Mar 1, 22 -**89**
- GRAND Central R., Belgium, tank, inset *Eng* \* Aug 16-**89**
- GRAND Trunk of Canada, express, inset *Eng* \* Dec 14, 21-**88** *Sc Am Sup* \* Feb 16-**89**
- GRANT works, Chic. *R Gaz* \* May 15-**91**, Cicero, Ill., inset \* June 17-**92**
- GRAZI-Tsaritsin R., So. E. Russia, 8-wheel *The Eng* \* Sep 4, 11, 11-**91**
- GREAT Britain and Ireland, number *The Eng* Sep 2-**92**
- GREAT Eastern R., England, express, inset *Eng* \* May 4-**88**, inset \* May 27-**92**, *The Eng* \* June 12-**91**
- GREAT Northern R., England, express *The Eng* June 8-**88** \* Nov 6-**91**, insets \* Dec 16, 16-**92**; of Scotland, pass., inset *Eng* \* May 23-**90**
- GREAT Western, England, broad and narrow gauge convertible, inset *Eng*\* July 8-**92**; works, Swindon *The Eng* Nov 16-**88**; early \* May 20, 27-**92**

**Locomotives, Headlight**, elec., Pyle's *El Wld* \* Sep 27-**90**, abs. *Inst C E* v 103 -**91**; elec. *R Gaz* Nov 29-**89**, Jan 17-**90**

HIGHLAND R., Scot., standard pass., inset *Eng* \* Oct 9 *R & Eng* \* Dec -**91**

HISTORY, the DeWitt Clinton, G. H. Thomson, inset *Am C E* \* v 23-**90**; old, the 'Sampson,' Robb *Am M E* v 10 -**89**; early, see H. Allen, v 11 -**90**; early, the steam buggy *E News* \* Sep 8-**88**; early, Horatio Allen \* Jan 11; the John Bull \* 18; hist. of development, ed. 18-**90**; Tomlinson, Pres. addr., insets, (full) *Inst M E* \* May -**90**

*R & Eng* \* Feb - Apr -**90**; Camden & Amboy R., Norris, n \* Jan -**92**; hist. of articulated, Brunner *R Gaz* Sep 25-**91** *Zeit Deut Eisenbahn*; early, Am. type and equalizing lever, Eastwick *R Gaz* \* Apr 22, 29-**92**; the rail, spike and locom., Watkins *Sc Am Sup* Dec 12-**91** *The Eng* \* Mar 7-**90**

HOELLENTHAL R., inset *Eng* \* Feb 6-**91**

HOIST, Chic. & No. W. *R Gaz* \* Feb 5-**92**

HUNGARIAN State R's, tank *The Eng* Feb 3, 10-**88**

ILLINOIS Cen. suburban, tests (full) *R Gaz* \* June 17-**92**

INDIA. Sind Pishin section, Indian State R's *Eng* Apr 13 \* 20-**88**, inset \* Apr 19-**89**, 6-coupled, meter gauge *The Eng* Mar 23-**88**; Indian Midland tank \* Nov 22-**89**

INDICATOR diags. at high speeds *E News* \* June 9, compound and ordinary, comparison \* July 7-**92**; indicating, Lyne, *R Gaz* \* Aug 2, Manning, cor. 16-**89**, do. Dean \* Feb 28; indicator cock, 4-way, Gifford \* Mar 7; diags., Worsdell's high speed compound \* Mar 28, No. E. R., England and ed. (and train resistance) 28-**90**

IRON Range & Huron Bay heavy frt. *E News* \* June 16, 12-wheel, inset \* July 7-**92**

ITALIAN pass. *R & Eng* \* June -**90**; Ital. Med. R. *The Eng* Nov 9-**88**, pass. \* Feb 1 \* Mar 29, goods, Sep 6 \* Dec 20-**89**, Paris exhib. \* Feb 21-**90**

JAPAN Imperial R's tank, inset *Eng* \* Feb 10-**88**

LAKE Shore & Mich. So. express, Brooks works (details), inset (full) *R Gaz* \* Nov 16-**88**

LANCASHIRE & YORKSHIRE, England, pass., inset *E News* \* Mar 28; 6-wheel frt. *R Gaz* \* Jan 30; tender water-scoop \* Dec 25-**91**; standard goods, inset *The Eng* \* Jan 1-**92**

LONDON, Brighton & So. Coast pass. *R & Eng* Sep, express pass., Paris exhib. *The Eng* July 19, 19-**89**

- Locomotives, London & No. W.,** Crampton engine, 1847, inset *The Eng* \* Nov 28-**90**; compound express \* Nov 20-**91**
- LONDON & So. W. works *The Eng* Sep 28-**88**; tank, inset \* Feb 5-**92**
- LONDON, Tilbury & So. tank *The Eng* \* Nov 25-**92**
- MANHATTAN Elevated R., N. Y. n R & Eng \* Jan -**90**
- MEDITERRANEAN R. *The Eng* \* Mar 13-**91**
- METROPOLITAN R., Lond., 4-wheel tank, inset *Eng* \* Dec 18-**91**; Met. Dist. R. pass. tank *E News* \* Mar 22-**90**, inset *The Eng* \* May 17-**89**
- MEXICAN Cen. (Fairlie system), inset *Eng* \* May 14-**90**; average econ., Johnstone, cor. *R Gaz* Nov 20-**91**
- MICHIGAN Cen. 10-wheel express *R Gaz* \* Feb 24-**88**
- MIDLAND R., England, express, inset *Eng* \* Mar 2, 16-**88**, exp. pass., Paris exhib. *The Eng* Sep 20-**89**
- MINERAL tank, Barry R. *Eng* \* Dec 2-**92**
- MOUNTAIN, two rack-rail, Abt system, Brunig R. and Riggenbach system, Brazil *E News* \* Nov 9-**89**. See also RAILROADS, mountain
- NARROW gauge frt., for So. Am. (meter gauge), Sharp Stewart, Glasgow *E News* \* May 17; compound, Baldwin \* Dec 13-**90**
- NEWPORT News & Miss. Val. 10-wheel frt. *R Gaz* \* Mar 16-**88**
- NEW So. Wales Gov't. R's, Baldwin 10-wheel *R Gaz* \* May 29-**91** *The Eng* Nov 23-**88** (full), July 1, Oct 14-**92**
- NEW York Cen. & H. R. 19 x 26 Brooks mogul, inset *R Gaz* \* July 25-**90**; suburban, inset \* Sep 11-**91**
- NEW York, L. Erie & W. express, inset *R Gaz* \* Jan 6-**88**
- NEW York & Northern, Rogers works, suburban service, n R & Eng \* Oct -**88**
- NEW Zeal. Gov't. R's tank, inset *Eng* Jan 29-**92**, do. for heavy grades, inset *E News* \* Nov 14-**91**
- NORTH Land. R. tank goods, inset *Eng* \* Oct 3-**90**, pass., inset \* Jan 9-**91**
- NORTHERN Pac. consolidation, inset *Eng* \* Oct 25, *Sc Am Sup* \* Dec 7-**89**
- OLD Colony R., simple and compound, tests, tables *R Gaz* Sep 16-**92**; pass., inset *The Eng* \* Nov 14-**90**
- OSCILLATIONS ap., West. R. of France *Eng* \* Jan 10; registering ap. *E News* \* Feb 8-**90**
- PENN. R. pass. *The Eng* \* Oct 17, 17-**90**

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- Locomotives**, PHILADELPHIA & Reading heavy consol. *R Gaz*  
\* Jan 4-**89**; express \* Apr 15-**92**  
PIECE-work classification (full) *R & Eng* Jan - Mar -**92**  
PISTON, rod breakages, report *R & Eng* \* Nov; Am. balance  
piston *R Gaz* \* Jan 3-**90**  
PRUSSIAN *R Gaz* July 11-**90**  
RACK rail. See LOCOMS., mt; RAILROADS, mt.  
RAUB, the, n *The Eng* Dec 7-**88**  
RESISTANCE, engine and ed. *E News* Jan 5, 5-**89**  
REVERSE lever, Cumb. & Pa. R. *R Gaz* \* May 23-**90**  
RICHMOND works *R & Eng* \* Oct -**90**  
RUSSIAN heavy frt. *R & Eng* \* Sep -**92**  
St. Clair tunnel decapod tank frt., inset *R Gaz* \* Apr 3, 10-wheel  
*The Eng* \* Apr 24 \* May 29-**91**  
St. Gall & Garis mt. road R., Switz., inset *Eng* \* Dec 30, 30-**92**  
SANDING ap., steam *Eng* \* June 29, do. *R & Eng* \* Aug, do.  
*R Gaz* \* Sep 14-**88**; Leach's sand feeding ap. *E News* \* Feb  
13-**92**  
SAXON State R., 4-cyl. compound *The Eng* \* Oct 23-**91**  
SCHENECTADY works *R Gaz* \* July 15-**92**  
SHAY, the, Gilpin Tramway, Col. *E News* \* Apr 26-**90**, inset  
*R Gaz* May 8-**91**  
SLIDE valves, friction of, Aspinall, discuss., insets *Inst C E* \* v  
95-**89** *The Eng* Dec 28-**88**; and cyls., Lond. Br. & So. C. R.  
Aug 23-**89**  
SMOKE-stacks, and exhaust nozzles design, W. H. Lewis *E News*  
\* June 23-**92**; cast iron *R Gaz* \* Apr 18-**90**; Manhat. eleva.  
R. \* Mar 4-**92**; straight, theory of, Snow *Sc Am Sup* \* Apr  
13-**89** *Am Mas Mech*  
SOUTH Eastern R., England, express pass., Paris exhib., inset  
*Eng* \* Apr 25 \* May 2 *E News* \* Feb 22-**90**, inset *The Eng*  
\* Nov 29 \* Dec 13-**89** \* Jan 3-**90**  
SOUTHERN R., Italy, goods, inset *Eng* \* Oct 31-**90**  
SOUTHERN Pac. R., 8-wheel, diag. *E News* \* Apr 25-**91**  
SPARK arresters, Bell's *R & Eng* \* Mar; Brown's and smoke  
stack *R Gaz* \* Nov 14-**90**  
SPRINGS and equalizers, Master Mech's com. report *R Gaz* \*  
June 29-**88**  
STRONG, the, distrib. of steam in, Dean *Am M E* \* v 9-**88**, sup.  
v 10-**89**; inset *Eng* \* May 17, 17, cor. June 7-**89**; Strong  
Manuf. works \* June 6-**90**; remarkable run *E News* Apr 6-

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**89** *F Inst* \* Feb -**88**; steam distrib., Dean *R Gaz* May 25-**88**; the 'A. G. Darwin,' inset \* Jan 11; indic. diags. June 28 \* July 26-**89** *Sci Am* Jan 12-**89**; insets \* *Soc Arts Mass*-**88**; Tratman *The Eng* Sep 13-**89**

SWEDISH pass. *R & Eng* \* May -**88**

SWINERTON polygonal driving-wheel *E News* May 24, Swinerton, cor. June 28-**90**

TAFF Vale R. 10-wheel tank pass., inset *Eng* \* Aug 2, 9-**89**

TENDERS, Wabash R. *E News* \* Dec 1-**92**; truck, U. P. standard *R Gaz* \* Dec 7-**88**; axles, muck-bar, tests, Watertown arsenal, Howard (full) Jan 4; trucks, Hickey, Feb 22, Mar 1-**89**; iron frame, N. Y. L. Erie & W. \* Apr 18; heavy axles, Master Mech's com. report \* June 20; iron frame, Brooks works \* Nov 7-**90**; hopper, Wabash R. \* Nov 18-**92**

TESTS, and elec. motor, comparative tests, Manhat. El. R., Moss, insets *Am CE* \* v 23-**90**; standard method, prelim. report *Am ME* \* v 13; experimental, Goss \* v 13-**92**, do. *E News* \* May 19, 19-**92**; Penn. R. n Apr 26-**90**; expts., Donkin *Eng* \* Oct 21-**92**

*R Gaz* trials, Manning \* July 12, 19; in Chili, Stillman, Dec 27-**89**; standard method, Dean \* June 20, 27; testing, Manning, July 18; the calorimeter in testing, Barrus \* Oct 17-**90**; Baldwin 10-wheel, B. & O., ed. (full) \* Nov 27, 27 \* Dec 11-**91**

*R Gaz* Old Colony, table, May 27; standard, com. report (full) 27; Ill. Cen. suburban (full) \* June 17; simple and compound, O. Col., tables, Sep 16; Schenec. prelim. Oct 7-**92**; Am. performance, n *The Eng* Apr 20-**88**; trials, Chili, Feb 14-**90**; experimental, Goss \* June 3-**92**. See also LOCOMS., compound; RAILROADS, speed

TIRE testing machine, Chapelle works, Paris *The Eng* Jan 6 -**88**

TRACK tanks, Balt. & O. R., Andrews *R Gaz* Oct 28-**92**

TRACTION, tractive power, diag. *E News* \* Sep 7-**89**; the Ries traction increaser \* Aug 9-**90**, ed. \* May 9-**91**; tractive power, n *R & Eng* \* Sep -**89**; how does it pull itself \* Apr -**92**; tractive force and train resistance *R Gaz* \* Oct 24-**90**, do. Slack *Steven's Indic* July 15-**88**; and driving, the mechanics of, R. H. Smith (full) *The Eng* \* May 13 \* June 3-**92**

TRALEE & Dingle R. narrow gauge *The Eng* \* July 15-**92**

VALVE, Child's cyl. *R & Eng* \* Jan -**89** \* May -**92**

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- Locomotives**, VALVE gears, Bonnefond's *Eng* \* Dec 20-**89**, do.  
*R Gaz* \* Jan 17; Hunt's pat. *R & Eng* \* June -**90**; Rickie's,  
Cawnpore st. R's, India *The Eng* July 6-**88**  
WABASH 10-wheel express, inset *R Gaz* \* Oct 17-**90**  
WATERFORD & Limerick R. *The Eng* \* Sep 12-**90**  
WEIGHING machine, Paris & Orleans R. *Eng* \* Nov 29-**89**  
WESTERN R. of France, Paris exhib. *Eng* \* Oct 18; tank \* Nov  
22-**89**; pass., inset \* June 6, 13-**90**  
WOOTTEN, the, com. report *F Inst* \* Sep -**91**; U. P. express  
pass. (boiler) *R Gaz* \* June 15, details \* Oct 5 *The Eng* July 6  
-**88**  
**Lock**, Havre transatlantic, iron gates, Widmer, abs. *Inst C E* v 92  
-**88** *An Ponts* \* v 14-**87**. See also CANALS, locks  
**Lock-nut**, the Cluther *The Eng* Sep 28-**88**. See also TRACK,  
lock-nuts  
**Locks**, elec. applic. to, Kintner *El Eng* \* Jan -**88**

**Lubrication**, viscosity, dets. of, Denton *Am ME* v 9-**88**, measurement of durability of lubricants, do. \* v 11-**90**, expts. with, do., Bissell, v 12-**91**, self-lubricating fibre graphite for machinery bearings, Cooper, v 13-**92**; friction of, Thurston *Cassier's* Oct -**92**; J. V. Wilson *Eng* \* Apr 20-**88**; anti-friction materials, Hedges, Aug 26-**92**; dry lubricants *E & Min* Aug 24-**89**; lubricating oil purifier *E News* \* June 21-**90**; the Holmes lubricant bearing, com. report *F Inst* Dec -**91**; measurement of durabil., Denton *Pwr* \* June; lub. oils exam., Stillman, Sep -**90** *Steven's Indic*; durabil. of lubricants, Denton *R Gaz* May 23-**90**; rationale of, Snowden, Feb 13-**91**; Barr, Dec 2-**92**; lub. oils, Charlier *Sc Am Sup* Nov 29 *The Eng* Oct 17-**90**; oils, ed. Sep 18-**91**. See also BEARINGS without lubs; FRICTION and lub; GREASE; OILS

**Luiz**, Dom I (King of Portugal) *Inst CE* v 100-**90**

**Lumber**, creosote, Fernandina works, Fla. *R Gaz* \* Nov 16-**88**; No. western traffic, Mar 25-**92**; cutting, circular saw or band, n *Sc Am Sup* \* Oct 25-**90**. See also WOOD

**Lunkenheimer**, Frederick, por. *Cassier's* \* Jan -**92**

**Lunn**, Robert W. *Inst CE* v 100-**90**

**Lyons**, John *Inst CE* v 101-**90**

**Machine**, moulding, Tabor *Am ME* \* v 13-**92** *Cassier's* \* July; design, æsthetics in, Barr, Aug -**92**; design, Unwin, bk. review *Eng* Apr 24-**91**; designing, intuition in, Hawkins *E Mag* July -**92**, do. *The Eng* Feb 15, 22-**89**; designing, Sweet *F Inst* \* Apr, do. *R Gaz* \* June 15, do. *Sc Am Sup* \* Apr 28 \* May 5-**88**; accident preventing devices, Cooper *Pwr* \* Dec -**90** *Am ME* v 12-**91**; construction, Richards, bk. review *R & Eng* Nov -**89**

SHOPS, Austrian regulations for *E News* May 31; slow burning construct., Boston Manuf's Mut. Fire Ins. Co. \* July 26-**90**; with weaving shed roof, Sweet \* Dec 15 *Am ME* \* v 13-**92**; France *R Gaz* May 2; framing, Wilmerding, Pa., Westinghouse \* April 11, June 6-**90**; Link Belt Machine Co. \* Apr 24 -**91**

**STOKING**, Spencer, discuss., insets *Inst CE* \* v 104-**91**. See also STOKERS, mechan.

**TOOLS**, mod., Dixon *Eng* Feb 3 *The Eng* Jan 20-**88**; power used by, n *E News* July 19-**90**; indic. diagrs. from, Breckenridge *Lehigh Eng* Oct -**88**. See also Shipyard machine tools, etc.

- Machinery**, The Mechanics of, Kennedy, bk; tight set-screws in, Cooper, discuss. *Am M E* -88; miscel., Roy. Agric. Show, Nottingham *The Eng* July 20; use of in construction, Price, Oct 26; sale of old, Sharp, Stewart & Co. 26-88; old, sale prices, July 19-89.
- Machines**, accident preventing devices applied to, Cooper *Am M E* v 12 -91 *Pwr*\* Dec -90. See also AUTOMATIC—SLOT machines
- Mackensie**, John *Inst C E* v 106 -91
- Mackintosh**, Alexander *Inst C E* v 101 -90
- Macnab**, Alexander *Inst C E* v 104 -91
- Macy**, Arthur, por. *E & Min* \* May 9-91
- Magheramorne**, Lord *Inst C E* v 101 -90
- Magic lantern**, optical projection, Wright, bk. review *Eng* Dec 4 *The Eng* \* Nov 13 \* Dec 25 -91
- Magnesite** as a refractory material, Sorge *E & Min* Jan 16 -88
- Magnetic**, circuits and measurements, Du Bois *El Rev Lond* \* Oct 9; induction, molecular proc. in, Ewing (full) *Sc Am Sup* \* Nov 14; reluctance, Kennelly (full) *El Wld* \* Nov 7, discuss. 21, (full) *El Rev* \* Nov 7-91; fields, graphic representations, Houston \* Sep 3-92. See also ELEC. magnetic
- SEPARATORS** *E & Min* \* Nov 5-92; Paris exhib., Hering *F Inst* \* June; Hall, cor. *The Eng* \* July 18-90
- BALL & Norton electro-, Ball *Am Min* \* v 19-91 *El Eng* \* Oct 8, Monarch *El Rev* \* Oct 11-90
- BUCHANAN'S ore *E & Min* \* Mar 10-83 \* June 15-89
- CHASE iron ore *E & Min* \* July 2 *E News* \* Sep 1-92
- EDISON's, n *E & Min* \* Dec 8-88 *Sc Am Sup* \* Jan 12-89
- HOFFMAN *E & Min* \* Dec 12-91
- LOVETT-Finney iron ore *E & Min* \* Nov 21-91
- MONARCH ore *El Rev* \* Oct 11, Ball *El Wld* \* 11 *E & Min* \* Sep 6, Ball *The Eng* \* Dec 5-90
- VENSTROM *E & Min* \* Nov 24-88
- WENSTROM, Cook *Am Min* \* v 17 -89. See also IRON ore concen., Birkinbine \* v 17 — mag. separators
- Magnetism**, relation to induced elec. mo. force and cur. E. Thomson *El Rev Lond* \* June 21-89; Hopkinson \* Jan 17, 31-90; and recalescence, do. *El Wld* \* Dec 20-90; Ewing's theory of, Crew *F Inst* \* Aug, Hoopes *El Wld* \* May 16; elec., galvanism and the telegraph, chronol. hist., Mottelay (very

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full) \* Apr 18-**91** - Feb 27, Sep 3, pors. 10 - \* Oct 22 - Dec 31 -**92**, etc.

*Sc Am Sup* influence upon crystallization, Decharme \* Mar 31; protection of watches against, Woodbury, Oct 20-**88**; curiosities, Bidwell (full) \* July 6; relation to induced elec. mo. force and cur., E. Thomson (full) \* Aug 17-**89**; Hopkinson (full) \* Mar 1, 8-**90**; recent prog. in Giles, Dec 26-**91**; wave propagation of, Trowbridge, July 2-**92**; Hopkinson *The Eng* \* Mar 7-**90**. See also ELEC. magnetism

**Magnetite**, crystalline, in Port Henry, N. Y. mines, Birkinbine *Am Min* \* v 18-**90**; Ontario, Ledyard, discuss. v 20, So. W. Va., Nitze, v 20-**92**; concentrating with Conkling jig at Lyon Mt., N. Y., Ruttmann *E & Min* \* June 9-**88**

**Magnets**, permanent, character of steel used for, Preece (full) *El Rev Lond* \* Sep 12-**90**, S. P. Thompson *El Rev Aug 8 El Wld* \* Aug 1, 8, 22-**91**. See also ELEC. magnets—magnetism, etc.

**Magnolia** metal for machine bearings, R. H. Smith report *The Eng* \* Dec 20-**89**

**Main**, John F. *Inst C E* v 110 -**92**

**Malaria**, malarious districts, treatment of *Eng* \* Mar 2-**88**; Celli *Sc Am Sup* \* June 27-**91**

**Malt** drying vac. stove *Sc Am Sup* \* June 30-**88**

**Man**, evolution in civilized, Powell *Sc Am Sup* Apr 7-**88**; effects on strength of injections from liquid from animals, Brown-Sequard, Aug 10, Brown-Sequard discov., Stockwell, Oct 19-**89**; man's upward struggle, Aaron, Aug 13; cerebro-spinal axis as a thermal center and power, Richardson, Oct 1-**92**. See also MEN

**Manganese**, manganese-steel, Howe *Am M E* \* v 12-**91** *E News* \* June 20-**91**; ores, argentiferous, Tombstone dist., Ariz., Goodale (supplementary) \* v 18 -**90**; ore deposits, Crimora, Va., Hall *Am Min* \* v 20-**92**; steel *El Rev Lond* Aug 10, do. Hadfield *Eng* Mar 9, Sep 7, 21-**88**

*E & Min* Santiago de Cuba mines, Reimer report, Nov 24-**88**; the Reymert manganese lode, Ariz., Blauvelt, Feb 9-**89**; the Crimora mine, Va. \* Mar 22-**90**; ores, U. S. produc., Weeks, Cen. bull. May 23; distrib. in No. Am., Penrose, Aug 1-**91**; metallic, Bullock, n *F Inst* July -**89**; bronze *The Eng* \* July 25-**90**

**Manual** training, education for the workshop, Perrine *E Mag* May; man. training-kindergartens, Plunkett *Pop Sci* July -92

**Manufactures**, time and cost keeping, Binsse *Am M E* v 9 -88; manuf'g industries net profits, ed. *Eng* Oct 9; practical prime cost, ed. Dec 4, 11-91; in U. S., growth, n *E News* Oct 11; industries stats., ed. *E & Min* Aug 2-90; and arts, review of prog. *F Inst* Feb -88; English manuf's in U. S., Siddell *The Eng* Nov 14, 21-90; Am., recent growth, Nov 25-92. See also INDUSTRIAL Co's

**Maps**, in relief, construct., Harden *Am Min* \* v 16-88; mercator chart drawing on one sheet, Kelvin *El Rev Lond* \* Sep 30-92; of ordnance survey, Scot. Highlands *Eng* Jan 6, 20 \* Feb 3, 17 \* Mar 2, 16, 30 \* Apr 13, 27 \* May \* June 1, 15, 29-88; pocket mapping instrum., Lane *E & Min* \* Apr 12-90

*E News* plotting contours, Lorimi, diag., cor. \* Feb 23; making topog. relief maps, cor. 23-89; Gov't., scale of, in Europe, n Dec 19-91; topog. lettering and marking ap., n Feb 6-92; mapping of the world *R & Eng* June -91. See also MINING maps; SURVEYING, topog.

**Marble** quarrying, U. S., Morse *E Mag* Oct -91. See also RAILROADS, Carrara-Marble District

**Marillier**, James C. *Inst C E* v 102 -90

**Marine** engineering, development and prog. during past 15 years, Seaton *Am Min* v 19 -91; *Eng* Nov 14-90, Jan 16-91; submarine gullies, Webb *El Rev Lond* Feb 24; concrete for marine constructions *Eng* July 20-88; some details in, Mudd, Apr 10 *The Eng* \* Apr 10; eng. during last decade, Blechynden, July 31, Aug 7, insets (full) *Inst M E* \* July *Sc Am Sup* Sep 19, 26 *Eng* July 31 \* Aug 21, Sep 18; practice 40 years ago, Denny, June 26-91; and ship-building in '92, Dec 23-92

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**Boilers**, Babcock *Cassier's* \* Jan -92; working and test pressures, Sennett *Eng* Mar 30 *The Eng* Mar 30-88; corrosion, Dodds, May 3 *Eng* Mar 29-89; double shell, Casebourne, Jan

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3; distrib. of evap. in, Stromeyer, Apr 11; furnaces, Kilvington, June 27-**90**; short, strength of \* Apr 17, cor. \* May 15-**91**; (navy) ed. Mar 18; failure of, ed. May 20; treatment, W. Wilson, Oct 21, Nov 4, 11-**92**

*E Mag* mod., Willits \* June -**92**; Walters *Pwr* Dec -**89**; tubulous, Leonard *R & Eng* \* July \* Aug \* Nov -**90**, Thwaite \* July; high pressure \* Mar -**91**; adaptation of steam machin. in marine construction, Emery (full) *Sc Am Sup* Jan 18, 25-**90** ALFONSO XII str., inset *Eng* \* Feb 15 \* Mar 1-**89** ALMY water-tube, Normand's *Cassier's* \* Sep *R & Eng* \* July -**92**

AUSTRALIA, Am. Pacific str. *The Eng* July 19-**89**

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BARHAM and Bellona S. S., insets *Eng* \* Nov 28 \* Dec 12, 12-**90**

CARSON, the, n *R & Eng* \* May -**91**

CALORIC str., compound *Eng* \* Aug 23-**89**

CITY OF Dundee str., inset *The Eng* \* Feb 26 -**92**

EDGAR, H. M. S. *Eng* \* Jan 1-**92**

FEED water heater, Edmiston's *The Eng* \* Feb 26-**92**

FORCED draught, Fothergill *Eng* \* Apr 6, in navy, 6, Soper, 6, Howden, cor. May 18-**88**; construction adapted to, Yarrow \* Mar 20-**91**; ed. *E News* Feb 22-**90**; prevention of leakage around tubes, Yarrow \* Apr 11, 18-**91** *Eng*, *The Eng* Howden, Feb 3, 10, cor. Mar 2; on the closed stokehold system, Soper, Apr 6, cor. 13, ed. 20, Fothergill, 6, 6; Fothergill's system, str. Hilda, Nov 2-**88**; construction for, Yarrow \* Mar 20-**91**

GRACE Darling steam yacht *The Eng* Mar 23-**88**

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LIQUID fuel, oil fuel in *E News* Feb 1-**90**; applic. to, Busley, abs. *Inst C E v 92* -**88**; furnaces for, do. *R & Eng* \* April -**88**

LYNX str., Great Western R., inset *Eng* \* June 13-**90**

MAINE, U. S. cruiser, N. Y. navy yard *R & Eng* \* July *The Eng* \* Apr 25-**90**

MIRA steam yacht *Eng* \* Mar 18-**92**

MODJESKA twin-screw str., inset *Eng* \* Oct 4-**89**

OPHIR str., Orient liner, insets *Eng* \* Nov 6, 20, 27-**91**

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ROSLIN Castle str. *The Eng* Nov 30, 30-88

SCOT str. *Eng* \* July 3, 10-91

SINOPE, Russian ironclad *Eng* \* July 18-90

TARTAR str. *The Eng* \* May 23-90

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CABLES, laying, Webb (full) *Sc Am Sup* Apr 19-90 *El Wld*. See also TELEGRAPH cables

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COMPASS, hist., theoretical and practical, Wilson-Barker *El Rev Lond* Apr 8-92; the Chase recording and alarm *El Wld* \* Jan 18-90; mariner's *Locom* Nov -91; adjusting at sea *Sc Am Sup* July 26-90. See also COMPASS

CONDENSERS, the Yaryan fresh water *Eng* July 26-89 *Pwr* \* Feb-90

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ENGINES, triple-expans. *Cassier's* \* Dec -91 \* Jan, econ. of \* Nov \* Dec -92; quadruple compound *Eng* \* June 1; h. p. of, report, Dec 28-88; wt. of, Mar 8; trip-expans. for river str. \* Nov 8; 1800 h.p. trip-expans. \* Dec 20-89; and eng. prog., 15 years, Seaton, Nov 14-90, Jan 16-91 *Am Min* v 19-91; Joy's assistant cyl. for *Eng* \* Apr 10; engine room practice, W. Wilson, May 29; Durston, July 31-91; steam nav., early hist., Kent *E & Min* Mar 7-91; 18,000 h.p. *Locom* May -89 *The Eng*; trip-expans. on lake strss., Miller *R & Eng* \* Jan -88; quadruple-expans. \* Jan -90 *Industries*

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The Eng development in Brit. navy, Mar 23, Apr 6, 20, May 4, 18, June 8, July 6, Nov 30; of str. Terrible, 1842, Aug 31, 31; first century of, Dyer, Sep 21, 28-**88**; effic. of, ed. Sep 13-**89**; compound, 60 years ago, str. Hercules\* May 16, 16, str. Batavia, \* Aug 8, Maasboot \* Sep 19, Moselle steamboat \* Dec 26-**90**\* Jan 23 \* Apr 3; ed. Feb 13; Joy's assistant cyl. \* Apr 17-**91**; trip-expan. in the mercantile marine, Dalrymple, Feb 19-**92** AGINCOURT str. *The Eng* May 18, 18-**88** ALFONSO XII, inset *Eng*\* Feb 15 \* Mar 1-**89** ARGUS str. *Eng*\* Jan 25-**89** AUSTRALIA and Galatea valve gear diag. *The Eng*\* Mar 29-**89** AUXILIARY, on shipboard, W. Allen *Eng* Jan 16, discuss., inset *Inst C E*\* v 104 -**91**; str. Violet, inset *The Eng*\* Aug 7-**91** BALANCING and vibrations of vessels *Eng*\* Apr 8, inset \* 15 *E News* \* Apr 28, (full) *R & Eng*\* Aug *Sc Am Sup* \* June 4, (full) *The Eng*\* Apr 8-**92** BARHAM and Bellona str., insets *Eng*\* Nov 28 \* Dec 12, 12-**90** BUENOS Ayres str., quadrup-expan., insets *Eng* \* Oct 12, 26-**88** CANFIELD's compound *R & Eng*\* Aug -**91** CERAM, Dutch gun-boat *R & Eng*\* Mar -**88** CIRCE str., trip-expan. *The Eng* May 11, 11-**88** CITY of Dundee str., inset *The Eng*\* Feb 26-**92** CITY of Paris, accident *E News* \* May 3-**90** CITY of Richmond str., indicating, Barrus *Am ME* \* v 11-**90** CITY of Vienna, trip-expan. with Morton's valve gear, inset *Eng*\* Apr 3-**91** CLUTHA ferry str., trip-expan., inset *Eng*\* Apr 26-**89** FALLS of Inversnaid str., inset *Eng*\* Nov 23-**88** FURST Bismarck str., insets *Eng*\* Apr 1, 22-**92** GOVERNORS, Churchill *Eng* Jan 17 *Sc Am Sup* Feb 22-**90** GRACE Darling steam yacht *The Eng* Mar 23, 23-**88** INDEFATIGABLE, trip-expan. *Cassier's* \* Oct -**92** IVY str., trip-expan. *R & Eng*\* Mar -**90** KAISER Wilhelm II str., insets *Eng*\* Aug 1, 15-**90** LADY Torfrida steam yacht, trip-expan., inset *Eng*\* May 10-**89** LA Flandre, Belgian Roy. Mail paddle str. *The Eng* \* Apr 5-**89**

- Marine** ENGINES, LORD of the Isles, oscil., inset *Eng*\* July 15-**92**  
LYNX str., Great Western R., inset *Eng*\* June 13-**90**  
MAINE, U. S. cruiser, trip-expan. *Eng*\* Feb 10-**88** *R & Eng*\* July *The Eng*\* Apr 25-**90**  
METEOR str., trip-expan., performance, com. report, Kennedy *Eng*\* May 10, inset\* Sep 13, trials, insets, do. (full) *Inst M E*\* May -**89**  
MINHO str., inset *The Eng*\* Aug 21-**91**  
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MODJESKA twin screw str., inset *Eng*\* Oct 4-**89**  
MOSELLE steamboat, compound, 1840 *The Eng*\* Dec 26-**90**  
NAIAD, English cruiser *R & Eng*\* Feb -**92** *Industries*  
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PURITAN, Fall River line *Eng*\* Jan 16, 23-**91**  
QUEEN's Is., and ship-building works *The Eng* Aug 17-**88**  
RE Umberto, 20,000 h.p. compound, Ital. twin-screw war str.  
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VAUBAN str., trip-expan. *The Eng*\* June 13-**90**  
VIOLET str. trip-expan., Lond. & No. W. R., inset *The Eng*\*  
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ZARIA, steam yacht, trip-expan. *The Eng*\* Mar 25-**92**  
GUN steady platform, Tower's *Sc Am Sup*\* Jan 10-**91** *The Eng*\* April 19-**89**. See also MARINE range-finder  
LOCOMOTIVE, Huet's ocean *Sc Am Sup*\* June 21-**90**; Midland R. works, Derby *The Eng* Aug 10-**88**  
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**Maritime**, Wash. conference, Colomb. *Eng*\* Mar 28, Apr 4-**90**  
**Market**, Buenos Ayres produce *The Eng*\* June 5-**91**  
**Markham**, Charles *Inst C E* v 95 -**89**  
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**Mars**, Ball Littell's Oct 22-**92** *Fortnightly Rev.* See also ASTRON., Mars  
**Martin**, Henry R. H. *Inst C E* v 91 -**88**  
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**Masonry**, construction, cost in detail *E News* Dec 8-**88**; indicator for detecting movements in, Abbott \* Dec 19-**91**; construction, Baker, bk. review *R & Eng* Nov -**89**. See also BRICK; CEMENTS, compressive strength and settlement of masonry

**Mass**, and motion, Mott *Sc Am Sup* Mar 15-**90**; and wt., n. Greenhall, cor. *The Eng* May 3, Lousley, cor. 10-**89**

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- TASCO district, Guerrero, Mex., Chism *E & Min* July 13, 20-**89**
- TELEGRAPH, the old, Utah, Laraguino *Am Min* v 16 -**88**
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- VENTILATORS, centrif. mine, expts., Norris (full) *Am Min* \* v 20 -**92**
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- Mirror**, Japanese magic *F Inst* \* Jan, Apr -**88**
- Miss.** river and Giuseppe Beltrami *Locom* Mar -**90**. See RIVERS, Miss.
- Mitchell**, J. E. *F Inst* Apr -**88**
- Molasses** distillation, Hutchinson *Sc Am Sup* Oct 10, Debremond, 17 -**91**
- Molding** machine, Tabor *Am M E* \* v 13 -**92**
- Monetary** unification and universal bank scheme, Granier *E & Min* \* May 17-**90**; money question, Mar 7-**91**

- Monitor**, as it is, cor. *The Eng* Mar 7-**90**
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- Montresor**, Charles E. C. *Inst C E* v 106 -**91**
- Monument**, the Columbus, Barcelona, Spain *Sc Am Sup* \* Dec 1, 29 *The Eng* Nov 23, 23-**88**
- Monumental** fountain, Paris exhib. *Sc Am Sup* \* Feb 16-**89**
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- Moore**, William *Inst C E* v 97 -**89**
- Morant**, Ernest F. *Inst C E* v 95 -**89**
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- Morday**, W. M., por. *El Wld* \* Aug 8-**91**
- Moreland**, Richard *Inst C E* v 104 -**91**
- Morland**, Henry *Inst C E* v 106 -**91**
- Morocco**, (min.) wealth of, Howarth *E & Min* Apr 12-**90**
- Mortars**. See CEMENTS and mortars
- Morton**, John H. *Am C E* v 26 -**92**
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- Motors**, Keely, T. C. Smith *E Mag* Oct -**91**; without fuel and second prin. of thermodynamics, Mehner *F Inst* Aug -**92**; small, comparative working expenses, Korte, abs. *Inst C E* v 105 -**91**; small, es. of cost, gas and elec., Davis *Sc Am Sup* Jan 9-**92** *Am Gas Lt'g J.* See also ELEC.—GAS motors
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- Mud** in Persian and Eastern architecture, Simpson *Sc Am Sup* \* July 30-**92**
- Muir**, James *Inst C E* v 96 -**89**
- Muir**, William *The Eng* Aug 24-**88**
- Muller**, Max, por. *Sc Am Sup* \* Oct 22-**92**

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*The Eng* naval power, Symonds, Feb 10; armed cruisers, ed. July 13; belted cruiser Australia, Dec 7-**88**; str. Victoria, insets \* Feb 15, Edinburgh \* Apr 5, Benbow \* June 7, the Inflexible \* Aug 2, the Collingwood \* 4-**89**, Imperieuse \* Jan 31, 31, Trafalgar \* Feb 28, Medusa \* July 4; estimates, Mar 14; condition, Aug 1; naval manœuvres \* 29-**90**

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*The Eng* navy estimates, Mar 11; H. M. S. Royal Sovereign, inset \* May 27; navy artificers, June 17; navy (list) July 1, 8; Capt. of the 'Mary Rose,' Clowes (full) \* July 29, Sep 16; Vulcan, inset \* Oct 7-**92**

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*E News* in 1890, n Jan 10; borings for rock along Broadway, diag. \* July 18; Rapid Transit Commission's report, diag. \* Oct 10, 17, plans, inset, ed. (full) \* 24, 24; pass. traffic, past and future of, ed. 31-**91**; rapid transit, Reno system \* Apr 2: rapid transit plans, Broadway franchise sale and specs., insets, ed. \* Nov 24, 24 \* Dec 1-**92**

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*E & Min* and cobalt, New Caledonia, Heard, Aug 11-**88**; and cop. deposits of Sudbury, Can., Bell, Mar 14; nickel-carbon oxide and applics., Mond, Sep 26-**91**; U. S. produc. '91, Ingalls, Jan 2; deposits of No. Car., Emmens, Apr 30; ores, New Caled., geol. and metallurgy of, Levat, July 9; anal., Emmens, Nov 26-**92**

*E News* nickel-steel, Am. Dec 13-**90**; metallurgy of, Levat, abs. *Inst C E* v 110 -**92** *An Mines* v 1 -**92**; and uses, Donald *Pop Sci* Dec -**92**; and steel alloys, Riley (full) *Sc Am Sup* Aug 24-**89**; and iron, volatile compounds, Townsend, Apr 23-**92**; carbon oxide and applics., Mond, Oct 10 *The Eng* Aug 28-**91**

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**Oil engines**, Knight's *The Eng* \* Aug 16-**89**; the Trusty \* Dec 4 -**91**. See also PETROL engines.

**Oils**, ethereal, notes on *Sc Am Sup* Mar 31-**88**; maize, in phar-macy, Kennedy, Oct 19-**89**; essential, notes, Jan 11-**90**; and fats, notes, May 2-**91**; for light-houses and light-ships, Edwards (full) Mar 19-**92**; ap. for det. liability to spontan. combust., E. Richards *Tech Q* \* Dec -**91**; the Broxburn works *The Eng* Aug 31-**88**. See also GAS, oil-gas; GREASE; LUBRICATION; PETROLEUM

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*Chem News*. See also LUBRICATION  
MIXING plant, Lehigh Val. R., Coleman (full) *R Gaz* \* Apr 10-  
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PAINT *Sc Am Sup* June 13-**91** *Chem Tr J*. See also OILS, lin-  
seed.  
PARAFFIN, manuf., Stewart (full) *Sci Am Sup* May 4-**89**  
PUMPING and engine data *E Rec* \* July 4-18-**91**  
STANDARD Oil Trust's agreement (full) *E & Min Mar* 3-**88**;  
ten years of, Dodd *Forum May* -**92**  
TESTING machine, East. R., France *Eng* \* Mar 14, 28-**90**  
**Oklahoma**, new territory *E News* Apr 20-**89**  
**Okonite** *El Rev Lond* June 8-**88**. See also ELEC. insul., oko-  
nite  
**Oldham**, James *Inst C E* v 103 -**91**  
**Oleomargarine** manuf. *E & Min Mar* 2-**89**; Caldwell (full)  
*F Inst Sep Sc Am Sup* Dec 10-**92**; Babcock (full) July 5-**90**  
**Opium** industry, Weir *Sc Am Sup* Sep 21-**89**  
**Optical** projection, Salomons *Sc Am Sup* Dec 17-**92**. See also  
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**Ore** *Am Min* Blake crushing system and results; deposits, struc-  
tural relations, Emmons (full); magnetite concen. with Conk-  
ling jig at Lyon mt., N. Y., Ruttmann; and matte-roasting in  
Utah, Terhune \* v 16, 16-**88**  
*Am Min* concen. of low-grade ores, Armitage; the Davis-  
Colby ore-roaster, Valentine, the Howells roasting furnace,  
additional diaphragm, Goodale; deposits stripping, McDowell  
\* v 18, 18-**90**; sampling, new system, Bridgman (full), without  
machinery, Glenn \* v 20 -**92**; the Lambertton crushing mill  
*Eng* \* Apr 11-**90**; pub. sampling works, Wins *E Mag* Apr  
-**92**  
*E & Min* ore sorting, Bartlett \* Apr 14; deposits of Red mt.  
mining dist., Col., Kedzie \* Aug 11-**88**; metallur. experience,  
Ontario mine, Utah, Janin, Jan 18; anal scheme for smelting

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Dougherty, Feb 8; deposits, isochemical lines in, Browne \* Apr 19; deposits and mines of Minas Geraes, Brazil, Mezger, Raymond, Aug 30, Sep 6-90; deposits of Pioche, Nev. Feb 7; supply for Vir. furnaces, Pechin, Mar 14, 21, cor. 28-91

*E & Min* sampling at El Paso, Tex., Johnson, Jan 16, 23; deposits of Creede, Col., MacMechen \* Mar 12, Kuby \* 19; deposits of Newman hill, Rico, Col., Farish \* Aug 20-92; dressing in Germany *The Eng* Aug 15-29-90. See also COLORADO; COPPER; IRON; NOVA Scotia; SILVER; TIN ore, Can.—Col., etc.

**Organic**, anal. by combustion. W. Dudley *Sc Am Sup* \* Jan 12-89; forms, causes of variation in, Riley, Nov 17, 24, Dec 1, 8-88; chemistry reforms in nomen., Burns *Tech Q* \* Oct 92

**Organs**, elec., Swinburne *El Wld* \* July 4-91, do. Paris exhib., Hering *F Inst* June -90. See also ELEC. organs.

**Oscillating** engines, relative piston speeds, MacCord *Sc Am Sup* \* Oct 31-91

**Otto**, Nicolaus A. *Eng* Feb 6, por. \* Mar 20, por. *Sc Am Sup* \* Apr 18-91

**Oxygen**, extraction, Murray *Eng* Feb 7; cyls. testing \* Apr 11-90; atomic wt. Oct 7, ed. 28-92 *Compt r*; indus. extraction and use *E & Min* \* Mar 29-90; Parkinson proc. \* Apr 30-92; extraction from atmos. *E News* \* Apr 12-90; Kassner proc., abs. *Inst C E* v 105 -91 *Genie Civil* 8-91; manuf. mechan. appliances, Murray, insets (full) *Inst M E* \* Jan -90; indus. applics., Thorne *Sc Am Sup* Apr 20, (full) June 1-89; active, in vital phenomena, Richardson, Feb 8-90; Parkinson's gas proc. \* June 11-92 *Iron*; liquefying, Dewar *The Eng* \* June 17-92. See also CHEMISTRY, oxygen

**Oyster** shells anal., L. P. Brown, n *Sc Am Sup* Mar 2-89 *Am Chem J*

**Ozokerite** (mineral wax), U. S. produc., Parker *E & Min* Aug 1-91; Utah, Seal *F Inst* Nov -90

**Ozone**, hist. synopsis, 1840-92 *El Rev Lond* Jan 22, Feb 12, Mar 18, Sep 16-92; Fahrig *Sc Am Sup* Feb 28; formation by combust. and presence in air, Renouf, Apr 19, formation by elec. discharges \* 26; industrial elec. ozonization \* May 31-90; Fahrig's electrostatic manuf. proc. \* Sep 24-92; *Chem Tr J, Am Chem J*

- Packing-presses**, hydr. (for cotton cloth), Hopkinson *Inst C E* \* v 99 -**90**
- Paddon**, William V. *Inst C E* v 103 -**91**
- Pagan**, John *Inst C E* v 96 -**89**
- Paine**, William H. *E News* Jan 10, por. *St R J* \* Feb -**91**
- Paint**, ore mines at Lehigh Gap, Hesse *Am Min* \* v 19 -**91**; fire-proof *E & Min* June 1 -**89**; mineral paints, Kemp, Jan 2 -**92**; *E News* Oct 12 -**89**; C. B. Dudley (chem. applied to R's) *R & Eng* July-Sep; oils *Sc Am Sup* June 18 -**91** *Chem Tr J.* See also OILS, paint
- Paint mill** *Eng* \* Feb 10 -**88**
- Palenque**, the Am. Pompeii *E & Min* Feb 22 -**90**
- Panorama** of Transatlantic Co., Paris exhib. *Eng* \* July 5 -**89**
- Paper**, Paper-making, Text-bk. of. Cross, bk., Spon, Lond. '88; industry, Hobart *E Mag* \* Jan; newspaper making from wood, Hanford \* Sep -**92**; sulphite fibre or pure wood cellulose manuf., Michaelis *E News* June 29 -**89**  
*Inst C E* sizing with rosin, Wyatt \* v 91 -**88**; testing of, Haselkoos, abs. v 95 -**89** \* *Zap Imp Russ* No 11 -**88**; manuf. *Locom* Jan -**89**  
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- Paper bag machine**, Paris exhib. *Eng* \* May 31, rotary block-bottomed paper, Duerden, discuss., insets *Inst M E* \* Oct; Am. *Sc Am Sup* \* July 13 -**89**; \* Feb 7 -**91**
- Paris**, France, st. cleaning, n *E News* Jan 17, Aug 22; rapid transit, the Ladame plan, map \* 29; st. cleaning *Sc Am Sup* Sep 5 -**91**; fires, see FIRE protection, also BUILDINGS; EXHIBITIONS; PAVEMENTS; RAILROADS; SEWERAGE; STREETS. WATER-works, etc.
- Park**, Prospect, Brooklyn, De Wolf, insets *E Mag* \* Apr -**92**; areas, n *Sci Am Arch Ed* July -**88**
- Parker**, Francis G. S. *Inst C E* v 100 -**90**
- Parker**, George C. *Inst C E* v 104 -**91**
- Parkes**, William *Inst C E* v 96 -**89**
- Pasley**, Charles (full) *Inst C E* v 103 -**91**

**Pasteur**, life work of a chemist, Roscoe (full) *Sc Am Sup* Dec 14 -89

**Pasteurizing** ap., Kuhn *Sc Am Sup* \* Oct 5-89

**Patents**, new and patented inventions, notes, Richards *Cassier's* \* Oct - Dec; influence on Am. industries, Mead, Dec -92; pat. law revision, Stewart (full) *El Eng* Jan, C. A. Brown, Feb; U. S. stats., Lockwood, Feb -88; a century of pat. laws, Blatchford, Apr 15-91

*El Rev* legislation, N. E. Elec. Light Assoc. discuss. Mar 10 -88; Am. system growth, diag. \* May 2; Brit. pat. and telegraph stats. June 27-91; law and what constitutes an invention, Lowrey (full) Mar 8 *El Wld* Mar 8-90; U. S. Commiss. report, Oct 5-89, Nov 1-90; Am. system, birth and growth, Mitchell, Apr 18-91

*Eng* interdependence of pats., ed. Mar 22-89, ed. May 2-90; centenary, Wash. June 5-91; German law, ed. Mar 4-92; see also files; 100 years of, Allison, pors. *E Mag* \* June -91; Am., limitation of by foreign pats. *E & Min* Feb 16-89

*E News* large decree for violation of, Tilghman glycerine pat. n Mar 31-88; business, n Dec 18-90; U. S. system, past and present, ed. Apr 18-91; claims, Starck *R & Eng* Jan -88; centenary of, ed. Apr, May -91; for small things (value of) *Sci Am* Nov 17-88; system, necessity for, Coale *Sc Am Sup* Mar 10-88; laws, a century of, U. S., Blatchford, May 9-91; French law *The Eng* Aug 2-89; English, value of, ed. Dec 25-91. See also ELEC. Co's, Edison incand. pats—lamps—patents; *Eng* and *The Eng* files; INVENTIONS; LO-COMS., compound; U. S. pat. office, etc.

**Patten**, Francis J., por. *El Eng* Apr 2-90

**Patterns** marking system, Frith *Sc Am Sup* Sep 21-89

**Paulson**, Webster *Inst C E* v 91 -88

**Pavements** and paving, carriageway, ed. *Eng* July 22, 29, Aug 12-92; and roads, Love, bk. n *E & Min* July 12-90 *E Rec*; valuation of road metal and setts for, Stock *E News* Sep 22 *The Eng* Aug 31-88; cost of, Howard *E News* Mar 15-90; st., Boston, May 12; st., in Am. cities, July 7-92

*E Rec* and st. R's, Stayton, Dec 3-31-87, Jan 7, 21, Feb 25, Apr 7, May 26, June 9, 16, Oct 13, Dec 8, 29-88, Apr 13, June 8, 15, Aug 3, Sep 14, Oct 5, Dec 7-21-89, Jan 4-90; st., Collingwood, Mar 7; paving material, Butts, May 2, do., tests, table, Shedd, Sep 26-91; st., Haupt *F Inst* Dec -89, st., Sargent

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- Sc Am Sup* Jan 14-**88**; and paving materials *St R J* July -**90**, \* Oct -**92**. See also ASPHALT; MUNIC. eng; ROADS; STREETS and names of cities
- ASPHALT, *E News* Jan 21; in Berlin, Hering, Dec 15-**88**; rock asphalt, N. Y. Sep 28; on concrete, N. Y., Nov 16-**89**; in N. Y., Gilroy report, May 5-**92**; Lond. asphalt, cost of maintaining *E Rec* Jan 18-**90**; Wash., D. C., details (full) Feb 14; laying, Berlin, Germany \* Dec 19, 26-**91**, Jan 2-**92**. See also ASPHALT
- BERLIN, asphalt, Hering *E News* Dec 15-**88**; paving, Dec 13 -**90**
- BOSTON, st. *E News* May 12-**92**, specs. *E Rec* July 25, Aug 1 -**91**
- BRICK, and brick manuf., Calkins, insets *Am C E* \* v 26-**92**; st., Kent *E & Min* June 21-**90**; Billingsly *E News* Feb 2; Ryan, June 15, 29; Hale system of \* Aug 3; discuss. Dec 21-**89**; fire-brick, Culley, notes \* Mar 1, spec. 8; Nebraska City, spec. Mar 29; tests of, Potter, June 21: bricks and, Chase, July 19 \* 26-**90**; tests, Butts \* Apr 11-**91**; tests, table *E Rec* May 2-**91**; Burlington, Iowa, spec. Feb 27; fire-clay, Cleveland, O., specs. Apr 16-**92**; st., Sargent, abs. *Inst C E* v 91 -**88** *J Assoc E Soc*s -**87**; slag brick paving, Wright *Lehigh Eng J* Feb -**89**. See also BRICK
- DETROIT, report *E News* Mar 29-**90**
- DULUTH paving imp. and sewerage *E Rec* \* June 28-**90**
- GRANITE, for st. work, Cen. bull. *E Rec* May 16-**91**; granite block measuring, Jan 16-**92**
- HALE, the *E & Min* \* Jan 25-**90**; system of brick *E News* \* Aug 3-**89**
- IRON and oak combination, Cole *Am M E* \* v 13 -**92**
- KANSAS City, Mo. specs. *E Rec* Aug 29-**91**
- LIVERPOOL, England *E Rec* Dec 12-**91**
- NEW York city, Broadway, spec. *E Rec* Dec 12-**91**
- ST. LOUIS, Mo., Mackland *E News* Mar 14; *E Rec* Feb 7-**91**
- STONE, noiseless, Nicolls *E News* Aug 2; slabs, Hudson river blue stone, Nov 29-**90**
- SYDNEY, New So. Wales, paved carriage-ways in, A. Mountain *Inst C E* \* v 93 -**88**
- TELFORD-Macadam *E News* \* Sep 7-**89**
- WOOD as material *E News* Sep 8-**92**

- Pazzani**, Julius *Inst C E* v 95 -**89**  
**Peach orchard**, a Conn., Hale (full) *Sc Am Sup* Sep 27, Oct 4-**90**  
**Peacock**, Richard *Inst C E* v 97 -**89**  
**Pearce**, Richard, por. *E & Min* \* Apr 4-**91**  
**Pearce**, William *Eng* Dec 21 *The Eng* Dec 21-**88**  
**Pearls**, chem. constitution, Harley *Sc Am Sup* Sep 15-**88**  
**Pendulum** expts., Foucault's *Sc Am Sup* \* Jan 7-**88**  
**Peninsular & Oriental Steam Nav. Co.**, ed. *The Eng* Dec 21 -**88**  
**Penny**, Alfred *Inst C E* v 101 -**90**, 107-**92**  
**Pensions**, old age, ed. *Eng* Dec 18-**91**  
**Percy**, John *Inst C E* v 99 -**90**  
**Perfumes**, odors and sense of smell, Henry *Sc Am Sup* Oct 8-**92** *Pop Sci*  
**Perkins**, George L., por. *R Gaz* \* Aug 3-**88**  
**Perkins**, Loftus *The Eng* May 1 *Inst C E* v 105 -**91**  
**Perrier**, Roland *Inst C E* v 91 -**88**  
**Perry**, John, por. *El Wld* \* July 11-**91**  
**Personal identification and description**, Galton, abs. *Sc Am Sup* \* Aug 18-**88**  
**Peru**, geol. of the Cerro de Pasco, and notes on topog., Hodges *Am Min* \* v 16 -**88**; Repub. of, Sears *NE Mag* \* Dec; commerce and resources, map, Pezet (full) *Sc Am Sup* \* May 7, 14; mining indus. Dec 24-**92**  
**Peters**, Edward D., por. *E & Min* \* Nov 14-**91**  
**Peto**, Samuel M. *Inst C E* v 99 -**90**  
**Petroleum**, and natural gas in N. Y. state, Ashburner, inset maps (full) *Am Min* \* v 16 -**88**; crude as fuel for raising steam at So. Chic. works, Potter, coal vs. oil in puddling furnace, Billings, oil as a metallur. fuel, Felton, v 17, 17-**89**; Racine system of burning crude oil *El Wld* \* Apr 6-**89**; Russian transport., ed. *Eng* Jan 20 \* Feb 3-**88**; storage, Carrington, Apr 10; as the future fuel of the Pac. Coast, May 22-**91**  
*E & Min* petrol. and its cognates, Hoefer, bk. review, Aug 4 -**88**; market review '87, Jan 7-**88**, Jan 12-**89**, '89, Jan 4-**90**, Jan 3-**91**; origin, Hoefer, May 16; U. S. produc., Weeks, Cen. bull. June 20-**91**, '91 and market review, Jan 2-**92**; burning, Aerated Fuel Co's system *E News* \* Nov 30-**89**; oil fuel, Minneap. water-works, July 28-**92**; transport., U. S. *E Rec* July 26-**90**; Russian and Am., Sadtler, map *F Inst* \* May -**88**

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*Inst C E* petrol. gas of Trenton limestone, Ohio, Orton, abs. v 104-**91** *U. S. Geol. Survey* v 2-**90**; storage installs. at Avonmouth and Cardiff, Pickwell, insets *Inst C E* \* v 104-**91**; reception and storage of refined in bulk, Carrington, discuss., inset (full) \* v 105-**91**; as fuel, Bost. & A. R., Springfield, Mass., expts. *Lehigh Eng J* Apr -**88**

*Sc Am Sup* petrol. launch Zephyr \* Aug 18-**88**; (molec. structure of matter) Anderson, Nov 23-**89**; refining and lub. oils, n Aug 15; origin, Ross, Nov 21-**91**; solidification expts., Rideal, Mar 26-**92**; petrol. ships, ed. *The Eng* Oct 26-**88**; liquid fuel ap., Great East. R., Holden's system \* May 15-**91**; Root's launch motor \* Sep 30-**92**. See also FURNACES, liquid fuel; LOCOMOTIVES, boilers, fire-boxes; WELLS, petrol.

**Petroleum** engines, W. Robinson *Eng* \* Oct 2, 9 *The Eng* \* Sep 11, 18-**91**; Unwin, Mar 11 *Eng* Mar 11 Robinson \* 11-25, Unwin, discuss., inset (full) *Inst C E* \* v 109-**92**; Durley \* v 110-**92**; 3-cyl., Muller, abs. v 100 -**90** *Gente Civil* \* v 16 -**90**; motor *Sc Am Sup* \* Sep 27-**90**; spirit engines *The Eng* June 15-**88**

BRAYTON, the *Cassier's* \* Aug *Eng* \* July 15-**92**

BUTLER's motor *The Eng* \* July 25-**90**

GRIFFIN's oil engine *The Eng* \* Dec 2-**92**

PRIESTMAN's *Eng* \* May 18 *E News* \* Nov 17-**88**, Sep 1-**92**; and Hornsby-Akroyd *The Eng* \* Sep 25-**91**

SPIEL's, etc., performance, n *The Eng* Aug 31-**88**

TRUSTY, the, n *Eng* \* Dec 2, portable *The Eng* \* Dec 9-**92**

YARROW'S *The Eng* \* May 25-**88**

**Pettit**, William *F Inst* Apr -**89**

**Phelps**, George M., por. *El Eng* \* June -**88**

**Philadelphia**, map *Eng* \* Mar 9, 16-**88**; mayor's message, Fitter *E News* Oct 12-**89**; pub. works, Aug 2-**90**; st. cleaning '91, n Nov 10; as a seaport, Mahan *E Rec* Apr 23, 30 *F Inst* Mar, Apr; port of, Haupt, Jan -**92**. See also FIRE protection, Phila. fires; MUNIC. eng.; PAVEMENTS; SEWERAGE: STREETS; WATER-works, etc.

**Philbrick**, Edward S. *E Rec* Feb 23-**89**

**Phillips**, Alfred *Inst C E* v 97 -**89**

**Phipps**, George H. *Inst C E* v 96 -**89**

**Phipson**, Wilson W. *Inst C E* v 108 -**92**

**Phonograph**, the new talking machines, Edison's, Hubert *Atlan M* Feb -89; graphophone, Tainter *El Rev Lond* \* Aug 3 *El Wld* May 19 (full) \* July 14; Gilliland \* May 19 *El Rev* \* May 19, Edison, June 16 *No Am Review* June -88; and micro-graphophone, Bleyer *El Rev* \* May 23-91

*El Wld* gramophone records, Houston, July 14, Berliner's \* Aug 18; some possible forms, O. Smith \* Sep 8, Hunter, n 22 -88; Bettini's micro-graphophone \* Apr 26-90; Edison's, ed. *Eng* Aug 17 \* Sep 14, 14-88; expt. \* Mar 15-89; phonos. and graphophones (full) *E & Min* \* Sep 15-88

*Sc Am Sup* Edison's new \* Feb 11; and graphophone (full) \* Oct 27-88; Edison's \* July 13-89, Johnson, Mar 29-90; Larranaga's photo-phon., Maier \* Feb 6-92; and phonographophone, Vaughan *Soc Arts Mass* -89. See also GRAMOPHONE; GRAPHOPHONE

**Phosphates**, slag, Phillips *Am Min* v 17-89; commercial, list of, Adams, v 18-90; indus., n *E Mag* Aug *E News* July 18-91, of Fla., Wilson, insets *E Mag* \* Oct -92, do. beds, Ledoux *E & Min* Feb 8, notes, Wyatt, Aug 23-90; So. Car. phos. rock market '90, Jan 3; deposits, Fla., notes on geol. of, Darton, Feb 14, do. origin and deposition, Davidson, May 30; of Am., Wyatt, bk. review, Nov 14; Fla. fields, notes, Adams, 21, 28, Dec 5, 12-91, do. U. S. produc. '91, Jan 2; Fla., mining, do. \* 23 \* Feb 13, Pratt, Apr 2; So. Car., mining, Benedict \* Mar 26; beds of Maltese Islands, Cooke \* Aug 27-92

*E News* indus., n July 18; phosphate of lime produc. July 11 -25-91; report, Terne *F Inst* Dec -92; beds of Fla., Ledoux *Sc Am Sup* July 12-90, deposits, Darton, Mar 14, origin and dep., Davidson, July 25-91; So. Car., mining, washing and calcining, Benedict, Apr 16; Fla., Pratt, 30-92

**Phosphorus**, rapid method of det. in ores, Woodbridge *Am Min* v 17-89; in pig-iron, steel and iron-ore, C. Jones, in cast iron, Keep, distrib. in Hudson river carbonates, Olmsted \* v 18, 18-90; the glow of, Thorpe *Sc Am Sup* Aug 9-90; manuf. by electricity, Readman-Parker proc. Oct 3-91 *Chem Tr J*

**Photography**, of coal mine interior, Dewey, insets *Am Min* \* v 16 -88; applies. to sci. purposes, Wood *Eng* Mar 30; stereoscopic, Stroh \* May 4-88; prog., Abney, Oct 4-89

*F Inst* recent advances in, Ives, May; chlorophyl and gelatine-bromide plates, do. \* June; substitute for glass, Carbutt, Dec -88; heliochromy, Ives, Jan, n Nov; amateur, in its educa-

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tional relations, Himes, May; substitution of gelatine for collodion, com. report, Sep; lenses, focus of, Cheyney \* Nov -89 \* June; proc. without metallic salts, Dec -90

*F Inst* in the colors of nature, Ives, Jan; heliochromy, Prof. Lippmann's, do. Aug -91; *Locom* Sep -89; in natural colors, Feb -90; surfaces feebly sensitive to light, Osborne *Sci Am* Jan 19-89

*Sc Am Sup* platinotype proc., Gunther, Jan 21, Willis, May 12; gold and silver salts making, camera, Feb 4; plates, flex. substitutes for \* May 5, manuf. \* 26 \* June 9; stereoscopic \* 9; stellar, Holden, July 28; transferring and coloring, on glass, Ashman, Aug 4; negatives, Rau, 11; notes, Sep 8; instantaneous, Howland, Oct 6; notes, 6, 13, objectives, Bausch, Nov 3, 10, Dec 8; printing plates, Nov 17-88

*Sc Am Sup* engraving on glass, Duchochois, Jan 26; the inventors of \* Feb 16; lenses, Beck \* Mar 30; the law and, Cooper, Apr 20; making dry plate emulsions, Lyon, May 4; orthochromatic, Litzkow, Aug 17; aut. ap. \* Dec 21; heliochromy (colored pictures), Oct 5, Ives n *F Inst* Nov -89

*Sc Am Sup* pictures distorting, Wallace, Mar 1; platinotype printing, Mar 1; composite, Batut \* Apr 5; a new photographic eye, Flammarion, May 3; ap., Lick observ., Holden \* Aug 16; image, Meldola, Sep 13; the Primuline printing proc. Dec 20 -90

*Sc Am Sup* tele-photog. (elec. transmiss. of pictures), Sutton \* Jan 24; in colors of nature, Ives \* Mar 14; in aniline colors, Green, May 2; aut., Enjalbert ap. \* 30; work of Herschel and Fox Talbot, Lang, Aug 15; postage stamp photos. \* 15; printing processes, Bothamley, 15; applics. of, Rayleigh \* 29; upon a black background \* Oct 24, 31; photographic chemistry, Meldola (full) Oct 24, 31, Nov 7; kite \* Nov 7-91

*Sc Am Sup* telescope lens, Dallmeyer \* Apr 9; notes \* May 7; composite heliochromy, Ives (full) July 2; photos. untrustworthiness \* Dec 17-92; of solar prominences, Hale *Tech Q* Nov -90

*The Eng Crystal Pal.* exhib. Mar 2, 9-88 \* Apr 5, 19 \* May 10-89; Marion & Co's works, Apr 20, May 4; Swain's photo-zincographic works, June 8-88; B. Edwards & Co's photographic dry plate works \* Mar 8-89; in natural colors, May 20, June 12; illum. of developing rooms, Aug 14; recent aids

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to science, Sep 18, Oct 9-**91**; Camera Club conference \* Mar 25; photos. (distortion) \* Nov 4; curious phenomena and applics. Dec 16-**92**. See also CHRONOPHOTOGRAPHY

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Photo-etching, intaglio plates, method *Sc Am Sup* Dec 28-**89**; on copper plates, Nov 1-**90**

Photogrammetry *Sc Am Sup* \* June 15-**89**

Photo-intaglio proc., Levy, inset *F Inst* \* Nov -**92**. See also PHOTO-etching

Photo-lithographic transfers, Wilkinson *Sc Am Sup* May 11 -**89**

Photo-mechan. processes, Koehler (full) *Tech Q* Oct -**92**; Water-lon's mechan. works *The Eng* Oct 5, 5, 19-**88**

Photo-micrography, imps. in, Zeiss ap. *E News* \* Jan 2-**92**; Pringle *Sc Am Sup* Oct 4-**90**

Physicians to Crown Prince of Germany, pors. *Sc Am Sup* \* Feb 4-**88**

Physical, National laboratory, Webster *El Wld* Aug 6-**92**; ap., economical, Ince *Sc Am Sup* \* Dec 13-**90**; science. See also GRAVITATION; MOUNTAINS; OCEAN; SCIENCE

Physics, Elements of (dynamics), Fessenden, bk., Macmillan, Lond. '92; precision of measurements, Holman, discuss. *Tech Q* Dec -**87** \* May, (very full) *El Eng* Feb, May, July, Sep -**88**; law of inverse square, Wolcott, Nov -**89**; Physical Soc., flow in a strained elastic solid, C. Wilson *Eng* \* May 16-**90**; pendulum measurements *Locom* Jan -**90**; absolute zero, Aug -**92**

Pwr what is a vacuum \* Dec -**89**; stresses produced by sudden forces and shocks, Merriman *R & Eng* Dec -**89**; instability of solids, ed. May -**90**; expts. in, Hopkins *Sci Am* Feb 2-**89**; superficial tension expts. *Sc Am Sup* \* Sep 8-**88**; Van 'T Hoff's law of osmotic pressure, Carnegie \* May 16-**91**; expts. upon surface films, Rayleigh \* June 11-**92**; regulator for maintaining constant exhaustion (gases in capillary tubes), Holman *Tech Q* \* Sep -**87**

Physiography, diametral, Kalakaua *Eng* \* Feb 24-**88**

Physiology of good and evil, Richardson *Sc Am Sup* Dec 14 -**89**

Piercy, Benjamin *Inst C E* v 96 -**89**

**Piers**, iron coal-pier, Norfolk & West. R., Va., Coe, *E Rec* \* Oct 29, discuss., insets; iron wharf, Fort Munroe, Va., Duncklee, discuss., insets *Am C E* \* v 27, 27-92 *E News* June 30; new, Southampton, Lemon *Eng* \* Sep 2-92; pier head at Marine Park, Boston *E Rec* \* Sept 21-89; on soft ground Ripley \* Mar 29-90; iron ice pier, Newcastle, Del. \* Apr 23-92

*Inst C E* compressed air foundations, Rochelle, La Pallice har., Thurninger, abs. v 100-90 *An Ponts* \* Nov -89; No. and W. coast, Scot., Barron, inset *Inst C E* \* v 99-90; subaqueous part of, method of construct., Kidd \* v 105-91; and pile abutments, Jameson *R & Eng* \* Feb -90; promenade pier, St. Leonards-on-sea *Sc Am Sup* \* June 23 *The Eng* May 11, 11-88; at Brighton \* Jan 29 \* Feb 12, old chain pier \* Mar 4-92. See also BRIDGES; HARBOR eng; PILES; TRESTLES

**Pig-iron.** See IRON, pig-iron

**Pile-driving**, uniform practice in, Crowell *E News* Dec 29-88, (full) \* Oct 27, Nov 3, 17, discuss., inset (full) *Am C E* \* v 27, 27-92; factors of safety *E News* Dec 29-88, ed. Apr 6; formulas, Trautwine, cor. Mar 16, May 11; South st. bridge, Phila. \* Oct 19, 19: cost of, Baker, Dec 14-89

*E News* and ditching plant, Om. & St. L. R., inset \* Aug 16-90; formulas, Husten, cor. and ed. Aug 25; safe load for piles, ed. Nov 17; pile-driving experience, Howe cor. Dec 8-92

*E Rec* pile driver and adjustable derrick \* Nov 9-89, revolving hydr. \* Apr 4; driving, Adams, July 25; a pendulum pile driver \* Dec 5-91; driving, Jameson *R & Eng* Oct -89; triple row driver *The Eng* \* May 8-91

**Piles**, allowable load on, Haagsma, cor. *Eng* May 6; pile and trestle timber structures, Western Am. R's, inset \* 20-92; safe bearing load, formulas, Trautwine, cor. and ed. *E News* Dec 29-88, Jan 19-89; sinking, jet and screen dike, Missouri river com. \* Dec 6-90

*E Rec* pile bridges cost of repairs, Talbot Sep 20-90; abutments and piers, Jameson *R & Eng* \* Feb; preservation, Mc Intosh, June -90; safety of pile bridges *R Gaz* Apr 26-89, and trestle, Minneap. & St. Louis, Hixon, cor. \* Apr 17, deep water R., Halifax har. \* Dec 25-91; protection(cost), Pritchard *Sc Am Sup* Mar 1-90. See also BRIDGES; BUILDINGS; FOUNDATIONS; HARBOR eng; PIERS; TRESTLES

**Piling**, sheet, clamp for, Emery, inset *Am C E* \* v 20-89; Wakefield's sheet *E News* Mar 1. Harris cor. \* 22-90

- Piles**, SCREW piles, in Germany *E News* \* May 26; for bridge piers, Spring \* Aug 4, cyl. pier sinking \* Sep 8-**92**
- Pill**-picker machine *The Eng* \* May 24-**89**
- Pilot** chart of No. Atlantic ocean, Hayden, map *F Inst* \* Apr \* June -**88**
- Pinchin**, Robert *Inst C E* v 95 -**89**
- Pins**, fibre stain in, J. B. Johnson *E News* \* Jan 28, Du Bois, cor. Mar 10; strains in, Fowler, cor. \* 24; and eye-bar proportions, Stowell, 31-**88**
- Pipe-joints**, steel, for spiral weld *E News* \* May 31; lead, calking, Aug 30; Holmes' flexible \* Nov 22-**90**; the Fenney cutting machine \* Feb 21-**91**; cast iron water pipe cement joints, May 5 \* Sep 8-**92**
- Pipes**, securing brass flanges to copper, Nagle *Am ME* v 9 -**88**; equation of, table *Cassier's* Nov -**91**; fittings moulding in U. S., Forbes *Eng* \* July 20-**88**; water flowage in, Airy \* Jan 4, 11; air vessels on, M'Creath \* July 5-**89**; Pott's labor-saving fittings *E & Min* \* Mar 7-**91**
- E News* and pipe flanges dimens., Codman \* Jan 12-**89**; computations, Cox, diag. \* Dec 22; measurement vel. of air in, Donkin, 22 *Inst C E*; hot water, india rubber, durability, Belleroche, abs. v 110 -**92** *Rev Mines* v 18 -**92**; cast iron, indus. in U. S. *E Rec* Mar 26; steel, specs. Dec 24-**92**; wrt. iron and boiler tubes, dimens., table, Morris, Tasker & Co. *Locom* Jan-**89**. See also GAS — SEWER — WATER pipes, etc.
- Pittsburg**, stats., Ricketson *Am Min* v 19 -**91**; *Eng* Oct 24 -**90**
- Pivot** bearing (footstep), friction, expts., report *Eng* Mar 27 \* Apr 17-**91**
- Planimeter**, polar, novel applic., Emery, inset *Am C E* \* v 18-**88**; polar, Gieseler *Sc Am Sup* \* Mar 17; spherical, H. Shaw \* Nov 3-**88**
- Planing** machines, plate edge, Forth bridge works *Eng* \* Dec 14 -**88**; Sellers', Paris exhib. \* Mar 14-**90**; double-acting tool rest *The Eng* Nov 9-**88**
- Plante**, Gaston, pors. *El Wld* \* June 22 *E & Min* \* 29 *Sc Am Sup* \* July 13-**89**
- Plants** evolution, Coulter *Sc Am Sup* \* June 16-**88**
- Plaster** of Paris manuf. and use *Sc Am Sup* Mar 21-**91** *Chem Tr J*

**Platinum**, electro-dep., Wahl *El Eng* July 16 *El Rev Lond* July 11 *El Wld* June 28 *F Inst* July, (full) *Sc Am Sup* Nov 22 *E & Min* June 21-**90**; metals (full) June 29-**89**; n Nov 29-**90**, Jan 3-**91**; *E News* Dec 20-**90**; and gold indus. of the Ural, Laurent, abs. *Inst C E* v 105-**91** *An Mines* v 18-**90**; *Sc Am Sup* Nov 23-**89**; prep. and es. of pure, Mylins, Oct 29-**92**

**Playing** cards manuf., Chilon (full) *Sc Am Sup* June 29-**89**

**Plumbing** *E Rec* \* Feb 4, 18 \* June 9, 16; N. J. law, July 7 \* 14, N. Y. specs. 21, Toronto, 28; Sep 1, 29, Nov 24-**88**; Boston Custom-house, May, June; Chic. regulations, Oct 26; N. Y. Cty. Court-house \* Dec 21-**89**; Turn Verein building, N. Y. \* Feb 8, 15; and drainage specs., N. Y. city, Apr 19, 26, May 3, 10; Boston law, June 21-**90**; St. Louis, Mo. inspection, Apr 4; Madison Sq. Garden, N. Y. \* 11; Birm., Ala., practice (rules) \* June 13; in 72d st. houses, N. Y. \* Nov 14-**91**; Chic. ordinance, Feb 13; Fifth Ave. theatre, N. Y. \* July-Sep; Suffolk Cty. Court-house \* Sep, Oct -**92**

**Pneumatic**, hoisting, Wheeler *Am Min* \* v 19-**91**; dispatch, Wildemann system *Eng* \* Nov 18-**91**; tool, MacCoy's, com. report *F Inst* July -**89**; pumping ap. *Iron Age* \* Dec 8; dispatch improvements *Sc Am Sup* \* Feb 27-**92** *Eng*; tubes, Postal telegraph system, Great Brit. *The Eng* \* Dec 18-**91**

**Pneumonia**, M. Smith *Sc Am Sup* Dec 1-**88**

**Pole** road locomotives *E News* Mar 2-**89**

**Police** signalling, Morgan's aut. elec. system, Hill *El Rev Lond* \* Mar 7-**90**

**Pollard**, Thomas S. *Inst C E* v 99-**90**

**Polygons**, regular, graph. construct., Weihe *Lehigh Eng J* Feb -**89**

**Pompeian** house of Pansa, restoration *Sc Am Sup* \* Nov 8 -**90**

**Population**, the world's, n *Eng* p 458, Oct 16-**91**; finding the center of, n *E News* June 15-**89**. See also under names of countries, cities and places

**Porcelain**, manuf. in France *Eng* \* Jan 17, 24 \* Feb 7, 21 *Sc Am Sup* \* Mar 22, 29-**90**; English china, Bayley, abs. Apr 7; manuf. possibilities, Elbers *E & Min* Feb 25-**88**

**Portable** engines and boilers. See BOILERS — ENGINES, portable

**Porter**, John A. por. *E & Min* \* Sep 26-**91**

**Post**, penny, jubilee, ed. *Eng* May 23-**90**

- Postal** telegraph, Great Brit. (full) *The Eng* \* Dec 18-**91**
- Posts**, yellow pine, new formula for, proposed, Stanwood *Tech Q* Apr -**92**. See also COLUMNS
- Posture** and its indications, Lander-Brunton *Sc Am Sup* \* Aug 13-**92**
- Potash**, report, Payne *F Inst* Dec -**92**; yellow prussiate *Sc Am Sup* Aug 11-**88**. See also CHEMISTRY, potash
- Potter**, William A. *Inst CE* v 91 -**88**
- Potts** Arthur *Inst CE* v 96 -**89**
- Potts**, Frederick A., por. n *E & Min* \* Nov 17-**88**
- Powder**. See EXPLOSIVES, cake — gun powder
- Powell**, John W., por. *E & Min* Jan 30-**92**
- Power**, measurement of, Gray *Am ME* \* v 13 -**92**; hot air and steam for *Cassier's* Nov -**91**; large units, economic limit of *Eng* Dec 4-**91**; supply at Liverpool, Feb 12-**92**; plants for hydr. *E News* Aug 23-**90**; river Rhone, util. of motive power at Geneva, Powles, inset *Inst CE* \* v 96 -**89**. See also DYNAMOS; ELEC. motors — power transmiss.; HYDRAULIC; NIAGARA Falls util.; POWER transmission; RAILROADS, elec. power stations
- Power** meter *EI Rev Lond* \* July 22-**92**; and indic., Waite *EI Wld* \* Mar 15-**90**
- Power** transmission, Hering *Cassier's* Apr; rope drive for, Grimshaw \* July; variable speed, Spaulding *EI Rev* \* Dec 24-**92**; by water and air, Donaldson *Eng* Mar 16, Hanssen, cor. Apr 27, May 11, 18-**88**; pneu. distrib., Lupton, Sep 12-**90**; elec Feb 20, 27, Kapp, Mar 6, and hydr., Blaine, May 22, June 5 Shaw's transmitter \* Dec 25-**91**
- E News* util. of Niagara n Nov 29-**90**; Hering, Mar 19 *Pwr* Apr -**92**; elec., Sprague *F Inst* \* Mar \* Apr -**89**; to great distances by compressed air, Unwin *Inst CE* \* v 93 -**88**; rope *Sc Am Sup* \* Mar 24-**88**; by manila ropes, Gregg \* May 24; Shaw's coil friction transmitter \* 31 *The Eng* \* Apr 18; *J Assoc E Soc*s; rope for *St R J* \* Apr \* Sep -**90**. See also BELTING; COMPRESSED air; DYNAMOS; ELEC. motors — power transmiss.; HYDRAULIC; RAILROADS, elec. power stations; ROPE driving; WIRE rope
- Precious** stones, produc. '91, Kunz *E & Min* Jan 2-**92**; Kunz *F Inst* Sep, Oct -**90**; and diamond cutting, do. *Sc Am Sup* July 11-**91**; in last decade, do. (full) *Soc Arts Mass* -**88**
- Preservaline**, for meat, Terne *Sc Am Sup* Feb 6-**92** *F Inst*

**Presses**, power press problems, O. Smith *Am M E* v 9 -88; foot press, n *Eng* \* Mar 13-91; drop, foundations for, Gorham Mfg. Co., Prov., R. I. *E News* \* Feb 22-90. See also FORGING — PACKING — PRINTING presses

**Pressure** gauges, for high pressure gases, Budenberg *Eng* \* Jan 29-92; open mercury column for high pressures, Bird *E News* \* July 19-90; mercurial, on Eiffel tower *E Rec* May 23-91

**Prices**, regulation, legal theories of, Hadley *R Gaz* Aug 12-92. See also FOOD ; LABOR and names of articles

**Priestley**, Joseph, por. (full) *Sc Am Sup* \* May 4-89

**Prime**, Charles *Inst C E* v 102 -90

**Prime movers**. use of spirit in, Yarrow *The Eng* \* May 31, ed. June 21; the Cardium (nature of), Gamgee \* Oct 18, Nov 1-89. See also ENGINES ; HOT air engines ; LOCOMOTIVES ; TIDE motors ; WINDMILLS

**Printing**, or relief plates making, Joyce proc., Hoke or Star proc. and Hanson proc. *Sc Am Sup* Oct 19-89

**Printing** machine, the electro-matrix *E News* Apr 13-89. See also TYPE-setting machines

**Prison** reform, Canonico *Sc Am Sup* Sep 3-92 ; Wayland *Soc Arts Mass* -89

**Prjevalsky**, N. M. (explorer-Asia) (full) *Sc Am Sup* Feb 23-89

**Professions**, the, shall they be regulated, Shaler *E Mag* Oct -92

**Professors**, private practice by, ed. *Eng* Oct 23-91

**Progress**, vibratory law of, Hovey *Sc Am Sup* Dec 22-88

**Projectiles**, elec. welded, Maxim *Cassier's* \* Oct -92 ; vel. of, Holden *Eng* Oct 23-91 ; Justin projectile, expts. *E News* \* Aug 4-92 ; path of, Gilman *F Inst* Oct, Ingalls, cor. Nov -91 ; forged steel, manuf., Carnegie, abs. *Inst C E* v 110 -92 ; Krupp's and plates expts. at Meppen *Sc Am Sup* \* Sep 8-88, do. and Brit. steel-faced plates *The Eng* July 13-88. See also GUNNERY and armor

**Propeller**, the jet *Sc Am Sup* Nov 15-90. See also SCREW propellers

**Providencie**, R. I., Brown University *Eng* \* Sep 11-91

**Psychical** research, Savage *Arena* Nov, (how we feel when we die) *Rev of Revs* Sep ; Psychology, internat. Congress *Sc Am Sup* Dec 24-92

**Public** works, National, cor. *F Inst* Sep -88

**Pulley** block Weston's triplex spur gear, Yale & Towne Co. *Eng* \* Aug 22 *E News* \* July 26-90

- Pulleys**, cone and step, method of finding diams., C. A. Smith *Am M E* \* v 10 -**89**; wood (various) *Pwr* \* Mar; size and speed \* Oct -**92**. See also BELTING
- Pullman**, Ill. *Eng* Oct 31-**90**
- Pulsometer**, test of a, De V. Wood *Am M E* v 13 -**92** *E Rec* Nov 21 *The Eng* Dec 25 *E News* Nov 21; Mashin's aut. steam vac. \* Apr 4-**91**; De V. Wood *Sc Am Sup* June 29, improvements \* Sep 14-**89**. See also PUMPS
- Pulverizers**, Buchanan's Granulator *E & Min* \* Jan 17-**91**; Am Ball \* Sep 24-**92**; the Ball mill *The Eng* \* Sep 26-**90**. See also DISINTEGRATORS; GRINDING; MILL, the Sturtevant
- Pumping** engines, Cornish or double beat pump valves, Nagle *Am M E* \* v 10 -**89**; new type, Laval *Cassier's* \* Sep -**92**; trip-expan., Mildura Irrig. Co., inset *Eng* \* Jan 18; machinery, Paris exhib., Hanarte system \* July 26-**89**
- E News* proposals, table, Feb 4-**88**; compound, power of, tables, Hill, Apr 27-**89**; machinery in the Fenland and by the Trentside, Gibbs, inset *Inst C E* \* v 94; underground, Bernissart coll., Ledent, abs. v 94 -**88**, do. high-lift, Vanhassel, etc., abs. v 107 -**92** *Rev Mines* v 2 -**88**, v 15 -**91**; machinery, ancient and mod., Holloway *Sc Am Sup* June 29-**89**; compound differential, Bradley, inset *The Eng* \* July 23-**91**
- BOSTON, high-duty, relative econ., ed. and cor. inset *E News* \* Dec 22, 22, Leavitt *E Rec* \* June 4-**92**
- BOURNMOUTH water-works, Worthington *The Eng* \* Jan 4-**89**
- BROOKLYN, N. Y., water-works, of 1860, hist., McElroy *Am M E* v 13 -**92**; 48-in. check valve *E News* \* Oct 24-**91**; Milburn station, trip-expan., inset \* Mar 12-**92**
- CHICAGO, Ill., West Side station, test of Indiana block coal, Nagle *Am M E* v 13 -**92**; tests *E News* Jan 31; trip-expan., inset \* May 31-**90**
- CORNISH, 'Davey' *Cassier's* \* Dec -**91**
- CROYDEN water-works, compound, inset *The Eng* \* Aug 29-**90**
- DAVEY'S differential, n *The Eng* Jan 13-**88**
- EATON water-works *The Eng* \* Dec 30-**92**
- ELECTRIC machinery, Wheeler *Cassier's* \* Nov -**91**; in mines *E & Min* \* June 15-**89**, coal mines *R & Eng* Mar -**88**
- HAMPTON, Davey's compensating lever at *Eng* \* Apr 22-**92**
- HARTLEPOOL Gas & Water Co., compound condens. *The Eng* Dec 21, 21-**88**
- HYDRAULIC, Pearsall *E Rec* \* Sep 26 *Inst C E* \* v 106 -**91**

- Pumping** engines, LONDON, East, water-works trip-expan., inset *Eng* \* Aug 8-**90**
- LUTON, sewage at, inset *Eng* \* Mar 29-**89**
- MECHALKONITZ, Moravia, underground at, Sauer, abs. *Inst C E* v 92-**88**
- MEMPHIS, Tenn., Worthington high-duty *Eng* \* Feb 12-**92** *E News* \* Aug 17-**89**, tests \* Sep 12-**91**
- MONTRÉAL water-works, cost of pumping '89 *E News* Dec 6-**90**
- PAWTUCKET, influence of steam jackets on, Denton *Am M E* \* v 11-**90**, Kent, v 13-**92**
- PETERSHAFT underground, inset *Eng* \* Oct 19-**88**
- RHYMNEY iron mines, inset *The Eng* \* Sep 19-**90**
- SCREW, Milwaukee flushing tunnel *E News* \* Mar 8-**90**
- TRIALS, duty trials of, Coon *Am M E* v 9-**88**, standard method, com. report, discuss. v 11, 11-**90** *E Rec* May 24, 31-**90**; Worthington, performance against a head equiv. to 2,000 ft. of water, Denton *Am M E* \* v 12-**91**; Chic. West side station, test of Indiana block coal, Nagle; pump test receiving water under pressure, Norris \* v 13, 13-**92** *Iron Age* \* Dec 8-**92**; Worthington high duty, Unwin report *Pwr* \* Jan -**89** *Eng* \* Dec 7-**88**; duty, Barrus, Feb 8, 15, Mar 1-**89** *The Eng* Feb 21-**90** *E News* Gaskill-Holly, duty and capac. test, report \* Feb 18; duty trials of, May 25, June 9-**88**; Barrus, Jan 19, 26, abs. *Inst C E* v 98-**89** *J Assoc E Soc*; performance of best mod. vs. Cornish of 1840, Denton *E News* Dec 28-**89** \* Jan 4, 18, 25, Feb 1, 8, 22; Chic. West Side tests, Jan 31-**90**; Worthington high duty tests, Memphis, Tenn. \* Aug 17-**89** \* Sep 12-**91**, do. tests, Lowell, Mass., Barrus \* Feb 20 \* Apr 16 *E Rec* Apr 9-**92** *E Rec* Worthington high duty, at Hampton, England, Unwin, Dec 22, 29 *The Eng* Dec 7, 14-**88**; Addington station, effic. *The Eng* \* Aug 29-**90**. See also ENGINES, tests and trials
- UXBRIDGE water-works *The Eng* \* Feb 12-**92**
- WESTON-super-mare, differential compensating *The Eng* Jan 13-**88**
- WHEELOCK, for Eiffel tower lifts *The Eng* \* Mar 7-**90**
- WILLAN'S central valve trip-expan. sewage *E News* \* Mar 9-**89**
- WORTHINGTON, W. Middlesex water-works *Eng* \* Jan 4; high duty *E News* \* Aug 17, attachment \* 31; Bournemouth water-works *The Eng* \* Jan 4-**89**; Oxford water-works, high duty compound \* Feb 27 \* Mar 6, 6, 13, 27-**91**. See also PUMPING engines trials, Worthington

- Pumping** stations, equip., Rafter *E Mag* Nov -91; designs *E Rec* \* Mar 15-29 \* Apr 5-26, May -90; movable plant, St. Louis \* Feb 27-92; at Jürgensfeld, Tolle, abs. *Inst C E* v 92 -88; at Bercy, Paris, Avdra, abs. v 100 -90 *Genie Civil* \* v 16 -90, Paris and reservoirs, Bechmann, abs. *Inst C E* v 105-91 *An Ponts* Feb -91; Agra water-works *The Eng* \* Jan 16-91
- Pumps**, AIR vessels on pipes and, M'Creath *Eng* \* July 5-89, Baird, July 5-91
- CENTRIFUGAL, effic., Webber *Am M E* \* v 9 -88; German Admiralty expts. *Eng* Feb 22-89; inventor of, Hodgkin \* Dec 5-90; effic. of, Sterk report, Dec 11-91; J. Richards *E News* \* Jan 31-91; and piston, comparative trials, Glehn, abs. *Inst C E* v 96 -89 *Bul Soc Mul* -88; with cir. ejector, Lavergne, abs. *Inst C E* v 107 -92 *Genie Civil* \* v 19 -91; Williams' machinery *The Eng* Oct 26-88
- DONKEY, Weir's, S. S. Normannia *Eng* \* Sep 26-90
- Dow's positive piston and difficulties in op. pumps *F Inst* \* Sep -89 *R & Eng* \* Dec -88
- HALL duplex *E News* \* Mar 3-88
- HYDRAULIC, compound plunger, Woakes *Am Min* \* v 20 -92; duplex compound, Buf. Steam P. Co. *E News* \* Dec 13-90; Roux's, abs. *Inst C E* v 94 -88 *Bul Soc Encour* -88. See also HYDRAULIC pumps
- MASLIN's aut. steam vac. (pulsometer) *E & Min* \* Dec 20-90 *E News* \* Apr 4-91
- POHLE's pump air-lift, Stetefeldt *E & Min* \* Dec 28-89
- PULSOMETER, test of, De V. Wood *Am M E* v 13 -92 *E News* Nov 21 *E Rec* Nov 21 *The Eng* Dec 25-91 *Sc Am Sup* June 29, imps. \* Sep 14-89. See also PULSOMETER PUMPS, Maslin's
- ROTARY, Johnson's *The Eng* \* July 3, boiler feeder \* Dec 25-91. See also ROTARY pumps
- TESTS, centrif., effic., Webber *Am M E* \* v 9 -88; pulsometer, Wood, v 13 -92 *E News* Nov 21 *E Rec* Nov 21 *The Eng* Dec 25-91; centrif., German expts. *Eng* Feb 22; Aug 9-89; centrif., effic., Sterk report, Dec 11; testing weir, Prov. water-works *E Rec* \* Oct 17-91; effic. of, expts., Isherwood *F Inst* \* Oct -89; centrif. and piston, compar. trials, Glehn, abs. *Inst C E* v 96 -89; water-pumps, expts. at N. Y., effic., Isherwood, bk. review, abs. v 99 -90. See also PUMPING engines trials
- VACUUM, Berrenberg's incand. lamp *El Wld* \* Apr 26-90; Nicol's shortened Sprengel *Eng* \* Feb 10-88

**Pumps, Valves**, divergencies in flange diams., Sanguineti *Am M E* \* v 9-**88**; Cornish or double-beat, Nagle *Eng* \* Dec 6-**89**

WARD'S *The Eng* Mar 16-**88**. See also ELEC. — vac. pumps

**Purden**, Wellington (full) *Inst C E* v 97-**89**

**Pyrometers**, air, Wiborgh *Sc Am Sup* \* Nov 24 *Eng* \* Sep 28-**88**; platinum, Callendar, June 17-**92**; and data, Howe *E & Min* \* June 7, 14 \* Oct 11-**90**; Saintignon's differential *Sc Am Sup* \* Apr 19-**90** *Genie Civil*. See also TELESCOPE, pyrometric.

**Quarantine** system of La., Holt *Sc Am Sup* \* Jan 7 \* Feb 4-**88**

**Quarries**, Box and Corsham, Bath *The Eng* Sep 28-**88**. See also BLUESTONE; BUILDING stones, Great Brit; GRANITE—SLATE — STONE quarries

**Quarrying**, mod. methods, Saunders *Cassier's* \* Sep -**92** *Am C E, E News* \* Nov 14 *Sc Am Sup* \* Dec 12 *E Mag* \* Apr; marble, U. S., Morse, Oct -**91**; and stone cutting mechanism *E & Min* Apr 6 \* May 25-**89**; granite cutting and polishing, Day, May 9; bluestone, U. S., Day, Cen. bull. June 6-**91**

*E News* new bar channeler machine \* Apr 13; a big quarry blast, So. Beth., N. Y. \* Sep 21-**89**; granite, Cen. bull. *E Rec* Apr 18-**91**; proc. of blasting dimension stone, Saunders \* Feb 20-**92**; mechan. and stone cutting *Sc Am Sup* \* June 29-**89**; granite *St R J* \* Oct -**92**; Belgian machinery, Paris exhib., Traigneaux q *The Eng* \* May 10-**89**. See also EXPLOSIVES; GRANITE; MINING; STONE cutting; TUNNELING

**Quartz** fibres, Boys *Sc Am Sup* \* Sep 28-**89**, (full) Apr 4-**91**; the Huntington mill *Eng* \* Oct 10-**90**

**Quartzites** and siliceous concretions, Crosby *Sc Am Sup* July 21-**88**

**Quatrefages**, A. De., por. *Sc Am Sup* \* Mar 19-**92**

**Quebec**, eastern, mining industries, Ells *Am Min* v 18-**90**

**Quicksand**, R. L. Harris' new proc. for dealing with *E News* \* Apr 28-**92**; action of quicksands, Airy *Inst C E* \* v 101-**90**

**Quicksilver**, produc. and trade '87, Randol *E & Min* Feb 11-**88**, in '88, do. Mar 2; mines, New Almaden, Cal., inset \* Jan 5; in Russia, Abegg, July 13; furnace, El Powenir, Spain \* Nov 16; mining, 30-**89**; mines, Cal. produc. Jan 4; deposits of So. Pac. coast, Feb 1; mining Co. report, 1871-90, Mar 14; mines and reduction works, Randol, Sep 6-**90**; stats. Jan 3-**91**; produc., Randol, Jan 2-**92**. See also MERCURY

- Rabies**, Huidekoper (full) *Sc Am Sup* Apr 13-**89**; and preventive treatment, Ruffer, Feb 22, Mar 1-**90**
- Race** tracks, laying out kite-shaped, Davison *E News* \* June 23; race course construct., Krause *Sc Am Sup* \* June 25-**92**, a theatrical, Varietes, Paris *The Eng*\* May 29-**91**
- Rack** and pinion, spiral coil, Quackenboss' *E News* \* July 18 -**91**
- Radcliffe**, John A. *Inst C E* v 104 -**91**
- Radiometry**, expts. in, Bennett *El Rev Lond* \* Aug 8-**90**
- Rae**, Frank B., por. *El Eng*\* Mar 18-**91**
- Rag** boiler explosion near Stockport *Eng*\* Mar 16-**88**; indus. *Sc Am Sup* Sep 5 **91**
- Railroading**, fifty years ago, early, in New England, Nott *Locom* Jan, June, Nov -**88**
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*R Gaz* aut., ed. June 15-88; Blodgett addrs. Sep 13; Soule \* Dec 13-89; dwarf, position, Sperry cor. \* Nov 28-90; imps., Blodgett *Soc Arts Mass* -91; insul. resist. of rail circuits, Mann *Tech Q* Apr -92. See also R's, switches—tunnel protection

**BALT. & O.** track standards *E News* \* Nov 7-91

**BLACK'S** aut. block *R Gaz* \* Jan 24-90

**BLOCK**, Strom aut. elec. safety *El Eng* \* Aug 24-92; Nichols *El Rev* July 12-90; system solution, Leonard \* Oct 10 *E Mag* \* Oct *El Wld* \* 10-91; aut., elec. applics. \* Jan 9, 16, N. Y. Cen. \* 23-92; and interlocking in Great Brit. *E News* July 26-90; Prov. & Wor. system \* Jan 16; what it is, ed. Feb 6; standard rules, Haines, Oct 13-92

*R Gaz* English practice, Farrer cor., ed. \* May 31, 31-89; Am. practice, May 2-16, June 6, Stewart, 20; Nichols, July 4; U. S. aut. \* Nov 7-90; Paine, Apr 24; Erie system \* Oct 9-91; uniform rules for working, Haines, Oct 14-92. See also R's, signals, Black's—Hall's—Kinsman's—Sykes, etc. **BOSTON**, Rev. B. & Lynn, Boston interlocked yard, Nat. Sw. & Sig. Co. *R Gaz* \* Aug 22-90

**CHICAGO**, Stewart ave. (complicated) crossings *R Gaz* \* Apr 24-91 \* Jan 29-92

**CHICAGO** and switches, Mil. & St. P. *R Gaz* \* Aug 3-88

**CLOCK**, Blodgett's elec. *R Gaz* \* July 27-88

**COMPENSATORS**, n *R Gaz* \* Mar 8-89; compensated distant, cor. Feb 28; Mitchell & Steven's wire \* Mar 7-90

**DOUGHERTY**, the, com. report *F Inst* Oct -88

**DRAW-bridge**, the Kelsey *R Gaz* \* June 15-88; Thames river interlocking \* Feb 14; 3-lever machine \* Nov 7-90

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- Railroads, Signals, France**, West. R., Paris exhib. *Eng* \* Aug 2, 9, Cen. R. Belgium \* Sep 13; No. R. elec. *R Gaz* Feb 21, Mar 7-**90**
- FITCHBURG R. aut. *R Gaz* \* June 15-**88**
- FOG, Drummond's *R Gaz* \* Dec 6-**89**
- HALL's aut. block system *E News* \* Sep 13, 20-**90** \* Jan 24-**91** *R Gaz* \* June 13 \* Sep 12, N. Y. Cen. \* Dec 5-**90**
- HAND and lamp *R Gaz* \* Nov 9, 9-**88**
- HARRINGTON's semaphore *E News* \* Mar 16-**89**
- HIGHWAY crossing, Street's *R Gaz* \* May 4-**88**; Hall's \* Mar 28; O'Neil's, n \* July 11-**90**
- HYDRAULIC, Paris exhib. *Eng* July 12-**89**
- JOHNSON'S, N. Y. Cen. *R Gaz* \* Jan 15-**92**
- KELSEY gong *E News* \* Feb 28-**91**; distant and do. *R Gaz* \* June 27-**90**
- KINSMAN'S block system *El Wld* \* Oct 1, and ed. *E News* \* Sep 29 *R Gaz* \* Sep 23-**92**
- KOYL'S parabolic semaphore *F Inst* \* Jan \* Aug -**89**
- LAMPS *R Gaz* \* Nov 9-**88**; A. H. Johnson \* Oct 24-**90** *Inst CE*
- LIVERPOOL, Lan. & York. Exchange station *The Eng* \* Aug 2 -**89**
- LOCK-and-block, with aut. treadles *Eng* \* Nov 18; Lattig's lock *R Gaz* \* Dec 30-**92**
- LONG'S elec. semaphore *E News* \* Dec 1 *R Gaz* \* Nov 30-**88**
- PNEUMATIC, West'gh. interlocking system *R Gaz* \* Dec 21-**88**; elec. selector for \* Nov 14-**90**
- ST. Gothard ap., Cox, abs. *Inst CE* v 95-**89** *Zeit deut Ing* -**88**
- SEMAPHORE, the parabolic, Stockett *Lehigh Eng* J June -**89**; illum., Union Sw. & Sig. Co. *R Gaz* \* Mar 30; showing color at night \* Oct 19-**88**. See also R's, signals, Koyl's—Long's
- SIEMEN'S elec. ap. *El Rev Lond* \* Apr 15-29-**92**
- SYKE'S block ap., N. Y. Cen. *E News* \* Jan 23-**92**; *R Gaz* \* Oct 3-**90**
- TORPEDO-placing machine, aut., Nat. Sw. & Sig. Co. *E News* \* May 23-**91**
- TRAIN, tail lights, ed. *R Gaz* \* June 29-**88**; Grigg's elec. air \* June 7-**89**; Johnston elec., n \* Jan 31-**90**
- WATERLOO station, Land. & So. W. *Eng* \* May 27 \* June 24 \* Sep 16 \* Oct 28 *E News* \* June 23, inset *R Gaz* \* Dec 16 *The Eng* \* July 29-**92**

- Railroads, Signals**, WEBB & Thompson's staff ap. *Eng* \* May 9 *E News* \* Mar 29, N. Y., N. Haven & H. R *Gaz* \* Aug 1 **-90**  
 WISE's train staff system *E News* \* June 23 **-88**  
 YARRINGTON's train order *R Gaz* \* Oct 24 **-90**  
 SIMPLON, projected, map *E News* \* Nov 1 **-90**  
 SIND Pishin *Eng* \* May 25, cor. Aug 17 **-88**  
 SLIDING, chemin de fer Glissant, Paris and ed. *E News* \* Aug 31, Oct 26, 26 **-89**, Barre, abs. *Inst C E* v 100 **-90**, *Soc Ing Civils* Jan **-90**, Galton *Sc Am Sup* \* June 7 **-90**, (full) *Soc Arts Lond.* See also R's, Glissant-hydr., Girard's  
 SNOW excavs. and ploughs, rotary shovel *Eng* \* Apr 5 **-89**; dimens., standard, N. Y. Cen. *E News* \* Nov 9; work of rotary, Aug 17 **-89**; Russell concave, Intercor. R., inset \* July 12 **-90**; snow on R's, Harkom \* Dec 29 *Can C E*, *R Gaz* Nov 18 **-92**  
*Eng* Jull's centrif. excav. \* Aug 30 *E News* \* Mar 30, Apr 27 **-89**, work of, Feb 22 **-90**, abs. *Inst C E* v 96 **-89** *R Gaz* \* Mar 29, cor. Sep 20 **-89**, Feb 21, rotary, trials \* May 23, and Otis, cor. \* 30 **-90**; ploughs, Denmark, Buron *Inst C E* v 91 **-88** *Rev Gen Chem* \* Aug **-87**; Judd's rotary steam, Miller Lehigh *Eng J* Apr **-88**  
*R Gaz* the Nevens snow flanger, Maine Cen. \* Feb 3; Cox's \* Apr 6; rotary steam (full) \* 20; Leslie's rotary shovel \* Oct 12 \* Dec 15 **-88**; ploughs, No. W. R. Club discuss. Jan 11; the Cyclone, Apr 26 \* May 10 **-89**; the Russell \* Oct 23; rotary steam wheel shovel \* Dec 25 **-91**; Gen. Elec. Co's snow sweeper *Sc Am Sup* \* Dec 31 **-92**  
 SNOW sheds, Can. Pac. Keefer, insets *Am C E* \* v 19 **-88** *E & Min* \* Mar 2 **-89**, Stoess *E News* \* Jan 21 **-88**; protection from slides, Selkirk mts., Can., Cunningham, abs. *Inst C E* v 94 **-88** *Can Soc C E* 2 **-87**, A. Frank *Zeit deut Ing* **-88**  
 SOUTH Australia *E News* Feb 7 **-91**  
 SOUTH Eastern, England, notes *E News* July 4 **-91**  
 SPAIN, practice, 20 years of *E News* Dec 13; Monte Generoso, abs. *Inst C E* v 101 **-90** *Schweiz Bauz* **-89**  
 SPEED, train, registering ap. *E News* \* Mar 5 **-92**; Sabouret's measuring ap. n *Sc Am Sup* \* Aug 9 **-90**  
 SPEEDS, train, express, ed. *Eng* Aug 23 **-89**; past and future, ed. *E News* Nov 7 **-91**; higher, McAlpine, Nov 17 **-92**; fastest on record *Locom* Aug **-88**; Banderali *R & Eng* July **-89**

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*R Gaz* English and Am., ed. Feb 28, 28; inertia and vels. of at different speeds, table \* Oct 31-**90**; latest fast long dist., Phil. & R. and others \* Sep 18-**91**; highest recorded \* Mar 11; high, conditions affecting, McAlpine, Nov 18; 100 miles per hour, ed. (full) Mar 18, Forney *Scribner's* -**92**; practical limit of *Sci Am* Oct 20; table, n *The Eng* May 4-**88**. See also LOCOMS. trials, performance

GERMANY and continent *E News* Nov 2-**89**

GREAT Britain, West coast fast run, England, ed. *E News* Sep 15 *R Gaz* Aug 10; notes, Aug 12, 19, Sep 2, 23-**92**; Edinb. fast *Sc Am Sup* Sep 29; fast, Great No. *The Eng* Mar 9; fast long dist. runs, a flight on the West coast, Aug 24, 24; the race to Edinburgh, profile Lond & N. W. Sep 14, Oct 12, Great No. and No. E. Nov 23-**88**

U. S., Am. fast, ed. *Eng* Sep 25-**91**; C. B. & Q. fast *E News* Dec 15-**88**; Phil. & R. Dec 8-**92**; Am., table, N. E. R. Club discuss. *R Gaz* Sep 14, Oct 19-**88**; latest fast long dist., Phil. & R. \* Sep 18-**91**; fast, Empire State express, Apr 15-**92**; fast pass. *Sci Am* Sep 8-**88**; table *Sc Am Sup* July 27-**89**; Am. fast time *The Eng* Aug 31-**88**; table, June 21-**89**; high, ed. Oct 16, 23-**91**

SPIKES, track, and lag screws holding power, Cox, expts. *E Rec* Nov 14-**91** *R Gaz* Nov 27-**92**; \* Dec 27-**89**, Oct 3-**90**\* Mar 6; adhesion of, Howard (full) \* May 1; the Greer \* Dec 11, test *E News* \* Mar 19-**92**; tripartite, Pat. Nut & Bolt Co. *The Eng* \* Aug 16-**89**

STATION indicator, the Allison *E News* \* Feb 14-**91**

STATIONS, elec. lighting *Eng* Dec 13-**89**; picturesque suburban, Gilbert *E Mag* \* Dec -**91**; small, standard plans, N. Y. Cen. *E News* Mar 31; suburban \* Aug 4, 25; Cen. R. of N. J. \* Oct 6 -**88**; minor structures, Can. Pac., inset \* May 24, 24-**90**; Macon & Birm. standard, inset \* May 26-**92**; and yards, design of, Parkinson \* Nov 29, inset *Inst C E* \* v 102 -**90**; Balt. & O., inset *E Rec* \* Dec 21-**89**; Mex. Nat. terminal proposed, inset *R Gaz* \* May 9-**90**

BAY City, Mich. Cen. *E News* \* Dec 27 *R Gaz* \* 26-**90**

BOSTON, Boston, Rev. B. & Lynn pass. *R Gaz* \* Aug 1 -**90**

BRENTOR, Plymouth & So. W. Junct. R., England *The Eng* \* May 30-**90**

- Railroads, Stations, Chicago**, Union Transfer *E News* \* Feb 8-**90**; and So. Side Rap. Tran. *R Gaz* \* Apr 11-**90**; exhib. terminal \* Sep 23; 12th st., Ill. Cen., inset \* Oct 14-**92**
- COLOGNE**, Germany, trainshed *E News* \* Oct 6-**92**
- DETROIT**, Mich., Fort st. union, inset *E News* \* Jan 31-**91**
- DULUTH** Union, inset *E Rec* \* Jan 2, construct. \* Feb 6, 6 \* Mar 12-26 \* Apr 9, 23 \* May 21-**92**
- DUNDEE**, Caled. R., insets *Eng* \* June 14, 28-**89**
- EDINBURGH**, Princes st., Caled. R. *Eng* \* Sep 30-**92**
- FALL River**, Mass. (Bowenville) Old Col. *R Gaz* \* Feb 27-**91**
- FORT PAYNE**, Ala., pass., Ala. Great. So. *E News* \* Sep 12-**91**
- FRANKFORT-on-Main** Cen., Germany, bk. review *E Rec* \* Jan 18-**90**, Union pass., insets (full) \* Sep 5-26 \* Dec 5-**91**, train shed erection \* Mar 5; arrangements, Wegele, abs. *Inst C E v 110* -**92** *Zeit Bauwesen* -**92**. See also BUILDINGS
- INDIANAPOLIS** Union *R Gaz* \* Jan 31-**90**
- JERSEY CITY** train shed, Penn. R. *E News* \* Dec 27-**90**, inset *R Gaz* \* Oct 2-**91**
- LISBON**, Pitsch, abs. *Inst C E v 103* -**91** *Genie Civil* \* v 17 -**90**
- LONDON**, & So. West. suburban *R Gaz* \* Sep 19-**90**; St. Pancras frt., Midland R. \* July 6 *The Eng* Apr 6-**88**
- LOUISVILLE**, Ky. terminal, L. & N. *E News* \* July 25-**91**
- MONTRÉAL** terminals, Can. Pac. *E News* \* Mar 3, arches and retaining walls, 17 *E Rec* \* Jan 7 *R & Eng* Feb -**88**
- NEWARK**, N. J., pass., Penn. R. *E News* \* Feb 14-**91**
- NEW YORK city**, Harlem Depression R. overtrack, inset *E News* \* Feb 8, 15; Grand Cen. *R Gaz* \* May 16-**90**
- OMAHA**, Neb., union, proposed *E News* \* Aug 17-**89**
- PARIS**, France, St. Lazare terminus, chem. de fer d' L'Ouest *Eng* \* July 12, 19-**89** *The Eng* \* Nov 13-**91**
- PERTH**, Scot *Eng* \* Aug 16-**89**
- PHILA.**, Broad st. terminal, Penn. R. *E News* \* Oct 6, 13 *R & Eng* \* Nov *R Gaz* \* Sep 30 \* Oct 21-**92**
- PITTSBURG**, train shed, B. & O. *E News* \* Feb 23-**89**
- PORTLAND**, Me., Union, inset *E Rec* \* Nov 30-**89**
- PROVIDENCE**, R. I. terminals, the Cove *E News* \* Apr 27-**89** \* Aug 2-**90**
- RYE**, N. Y., N. Y., New Haven & H. *E Rec* \* Nov 23-**89**
- ST. LOUIS**, Mo., Union pass., train shed *E News* \* Oct 3-**91** \* Apr 2, insets 21, 28-**92** *R Gaz* \* July 24-**91**
- SPRINGFIELD**, Mass. pass., B. & A. *R Gaz* \* Mar 14-**90**

- Railroads, Stations, TAVISTOCK**, Plymouth & So. West. J. R. *The Eng* \* June 13-**90**
- STOCKS and coal, prices '88 *E & Min* Jan 12-**89**
- STOP, Rowell-Potter aut. safety *E News* \* May 11-**89**, Boston, Rev. B. & L., Oct 20; Fox emergency, n *R Gaz* \* July 8; stopping from 90 miles per hour, cor. Sep 23-**92**
- STREET. See STREET railroads
- STRIKES prevention, ed. *R Gaz* Mar 29, C. F. Adams *Scribner's* Apr -**89**
- SUMATRA *E News* Nov 16-**89**; W. Coast State, Kuntze, abs. *Inst C E* v 105 -**91**, Post, abs. v 107 -**92** *Zeit deut Ing, Rev Gen Chem* July -**91** *R & Eng* \* Nov -**91**; Queen's Bay & Oembilin, map *The Eng* \* Apr 22-**92**
- SUPERINTENDENT's daily summary of reports, tables *R Gaz* Aug 3-**88**
- SUPPLIES, purchasing and care of *R Gaz* Feb 14, 21, Mar 14 -**90**
- SURVEYING, surveys and resurveys Paul *E News* Sep 12-26; slope stake setter and universal indic. \* 12-**91** *The Compass*; use of the stadia in, J. B. Johnson *R Gaz* Feb 3 \* Mar 2, 9, 30; camp and field life on U. P. surveys, Middleton *Sc Am Sup* July 7-**88**. See also SURVEYING
- SWEDISH, Koersner *Eng* Jan 6, Sandberg, 13; 25-ton iron ore wagon *The Eng* Apr 27-**88**
- SWITCHBACK, the Stampede, No. P., Huson *R Gaz* Feb 3-**88**
- SWITCHES, Dailey aut. cut-out *E News* \* Mar 26; point, B. & A. 31; sig. system, Elizabethport station \* Nov 24-**88**; Price frogless \* Apr 6; safety lock, Lehigh Val. \* June 15; slip, or combination cross over, Cincin. \* Nov 16-**89**
- E News* aut. cam lock \* May 24; Dunn safety \* Aug 23; prog. in interlocking ap., Union Sw. & Sig. Co. \* 23; and frogs, experience with, Ellis \* Sep 6-**90**; turnouts, functions of, Washburn, inset *R & Eng* \* Oct -**89**; 3-rail turnouts for double gauge tracks, Geddes (full) \* Apr-July -**92**
- R Gaz* interlocking ap., Long Is. R. \* Feb 10; and sigs., interlocked, C. R. Johnson, May 4, 18, June 8, July 27; German, movements \* Aug 10-**88**; slip, with movable frog, Un. Sw. & Sig. Co. \* July 12-**89**; sliding and Parson's frog, Brooklyn br. R. \* Jan 24-**90**; and frogs, Ellis, May 29; interlocking machinery, Hall Sig. Co. \* Sep 25-**91**; interlocking, Wuerpel mach. \* Sep 16-**92**

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- Railroads, Switches, Bay City Junct., Detroit, Mich. Cen., interlocking** *R Gaz* \* Nov 14-**90**  
**BOSTON & ALBANY standard** *R Gaz* \* Mar 2-**88**  
**DRAW-bridge interlocking plant, N. Y., Pa. & O.** *R Gaz* \* Jan 10-**90**  
**JERSEY City, terminus, Erie R., interlock., inset** *R & Eng* \* June -**91**; yard, Cen. R. of N. J., Un. Sw. & Sig. Co. *R Gaz* \* June 28-**89**; N. Y., L. Erie & W. \* May 22; pneu., Penn. R., Sperry \* July 31-**91**  
**JOHNSON interlocking mach.** *R Gaz* \* Jan 18-**89**  
**KELSEY & STEVENSON'S aut.** *R Gaz* \* Feb 13-**91**  
**NEW YORK, Grand Cen. station interlocking** *R Gaz* \* Dec 27 -**89**  
**PARSON'S block & sig. system** *R Gaz* \* Aug 16-**89**  
**ROBINSON-WHARTON** *R Gaz* \* Sep 21-**88**  
**ST. LOUIS Br. & Junct. R. interlock. system, Eayrs** *R Gaz* \* Feb 8-**89**  
**SALEM, Mass. tunnel, interlock.** *R Gaz* \* Feb 22-**89**  
**TELEGRAPH** supts. pro. *El Rev* Oct 26 *El Wld* 26-**89**. See also TELEGRAPH  
**TEXAS frontier, building, Rafter** *E Mag* \* Oct -**91**  
**TICKETS, Cin., Wabash & Mich.** *R Gaz* \* Mar 13-**91**; Chic. & Alton \* Jan 22-**92**  
**TIES. See CROSSTIES**  
**TIME, unpunctuality, English, ed.** *Eng* Dec 16-**92**; general time convention *R Gaz* Oct 12-**88**. See also TIME  
**TRACTION, h. p. of tabulated constants for det., Crane** *El Eng* Nov 19-**90**  
**TRAFFIC, Am. and English** *Eng* Jan 1-**92**; suburban, Booth *R Gaz* Dec 13-**89**, Jan 24-**90**; Chic. east-bound, Apr 10 -**91**; interchange facil., Godkin, Jan 29-**92**; and earnings, ten years growth, ed. Nov 13 *The Eng* 13-**91**; U. S. *R Gaz* files  
**TRAIN dispatching, op. of, safety systems, ed.** *E News* Oct 12-**89**; graphic record, diag. \* Sep 5-**91**; duplicate order system *R Gaz* Jan 10; Kinsman, July 4; Am. system, ed. 25-**90**  
**TRAIN indicator, standard, Rich. & Dan. system** *E News* \* Feb 9-**89**  
**TRAIN lighting, elec.** *E News* Apr 7-**88**, Seldon, Nov 2-**89**; Timmis' system *The Eng* Apr 13-**88**. See also CARS, lighting

### 310 RAILROADS, TRAIN RESIST.—TURNOUTS

**Railroads, TRAIN** resistance, air, expt. study, Crosby *Eng* May 30 \* June 6, 13-**90**; the grain of sand on the track, Field *El Rev* Apr 30-**92**; expt. study, Crosby (full) *El Wld* \* May 24-**90**; and power \* June 18; high speed, July 9-**92**; early expts. *E News* Sep 1, and air resist., ed. 1; laws of, Oct 6, ed. 27; C. B. & Q. (valuable) report, diagrs. \* Nov 17, 24-**88**; Desdouits expts. *R & Eng* Apr -**91** *Inst CE*

*R Gaz* No. E. R., England, ed. \* Mar 28; air resist. at very high vels., Chanute cor. Dec 26-**90**; locom. cyl. power consumed ahead of first car \* June 17-**92**; Slack *Steven's Indic* July 15-**88**; *The Eng* Apr 6, Sep 21, 21-**88**, ed. Mar 14-**90**. See also AIR ; ATMOSPHERIC resist.

**TRAINS**, vibrations instruments, Milne *Eng* Oct 11-**89**; colliding, destructive force of, cor. *E News* Aug 4, 25, Adams, Sep 8-**88**; length increase on Austrian R's \* Mar 22-**90**; sanitary *Sc Am Sup* \* Jan 21-**88**; articulated rolling stock, Paris, Sceaux & Limones R. *The Eng* \* Nov 21-**90**; speeds, see R's speeds; stop, see R's stop

**TRANSANDINE**, Argent. Repub. & Chili *Eng* \* Sep 19-**90**, tunneling plant, inset \* Apr 24 \* May 22-**91**; map *E News* \* Oct 25-**90** \* Feb 13-**92**; Child *Harper's M*, *R & Eng* Dec -**90**, n Jan -**92**, *R Gaz* \* Oct 17-**90**, *Sc Am Sup* \* June 20-**91**

**TRANS-Caspian**, Rymkienicz, map *E News* \* Sep 29-**88**; and territory, Heyfelder, abs. *Inst CE* v 92, Strukel, abs. v 94-**88**; *R Gaz* Jan 3-**90**; *Sc Am Sup* \* Feb 11-**88**

**TRANS-Caucasian** *E News* Feb 11-**88**

**TRANSFER-tables**, N. Y. Cen., inset *E News* \* Dec 21-**89**; elec., Fitchburg R. shops *R & Eng* \* Feb -**90** *R Gaz* \* Dec 6; Penn. (full) \* Mar 22-**89**

**TRANSPORTATION**, N. E. and Middle stats, Cen. stats. *E News* Nov 14-**91**

**TRANS-Siberian**, ed. *Eng* Aug 12 *Sc Am Sup* \* Jan 30-**92**, map *The Eng* \* Dec 4-**91**; world, map *R & Eng* Nov -**90**. See also R's, Siberian

**TRESTLES**. See TRESTLES

**TUNNEL** protection, block system, cor. ed. *R Gaz* Mar 13, 13-**91**

**TURKEY**, Asiatic, construct. *E News* \* Dec 15-**92**

**TURNOUTS**. See R's, sidings - switches

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- Railroads, Turntables**, Silverton R., Col., Gibbs, discuss. *Am CE* \* v 23 -90; and traverser, St. Lazare station, Paris *Eng* July 19; Paris & Or. R., Paris exhib. \* Nov 15-89; wrt. iron deck *E News* Dec 21-89; wrt. iron \* Jan 4-90; Jameson *R & Eng* \* Oct -89; 60-ft., for 100-ton locom. *R Gaz* \* Feb 28-90; standard, Passaic Rolling Mills Co. \* Feb 5; for Howe truss draw-br., Fraser river, Can. Pac., Cambie \* Nov 25 -92
- Uleaborg**, Finland, Strukel, abs. *Inst CE* v 92 -88
- Underground**. See also Rap. Tran. Commiss. report to Mass. Legislature, Apr 5-92; **Tunneling**, Great Head system; **Tunnels**
- Baltimore** Belt, insets *E News* \* Dec 12, 19-91, York road tun., inset \* Jan 9-92
- Blanc** system of subway structure for city sts. *El Wld* \* Mar 22-90
- Glasgow** Cen. *Eng* \* Oct 5-88, May 30-90, map \* May 27 \* June 3 \* July 1, 15, inset \* 22 \* Aug 5, inset \* 19, 19-92; and Dist. covered way, W. Wilson *Inst CE* \* v 92 -88; building *R & Eng* \* Sep -92
- London**, Central R., proposed, bill *Eng* Mar 6, 13-91 *The Eng* July 11-90, bill, Mar 6, 13, Islington, 20, 27-91
- City & So. Lond.**, elec. locom. *El Eng* \* Nov 26, subway *El Rev Lond* \* 7-90; files -91; Grindle, July 29, Aug 12, and cable, Sep 16-92; *El Wld* \* Nov 29; deep tun., ed. *Eng* \* Nov 7, 7 \* Dec 26; *E News* Nov 29-90; *R & Eng* \* Jan; subway *R Gaz* Dec 11-91; report, Mar 4-92; Southwark subway *Sc Am Sup* \* Oct 11-90 *The Eng* \* June 7-89; \* Nov 7-90
- Metropolitan**, notes *E News* \* May 2-91, n *The Eng* Jan 27-88; tunnel purification, Jan 29-92
- New York city**, elec. rap. tran., Sprague *El Eng* \* Mar 4, report, Apr 1, May 27; Reno elec. proposed, map *El Wld* \* Feb 14 \* June 20; Met. Co's tun. under East river, inset *E News* \* Mar 14-91; rap. tran. plans (full) *E Rec* \* Nov 26 \* Dec 3-17; Met. (full) *The Eng* \* Jan 22-92. See also **Rapid transit**, N. Y.
- Paris** elec., n *El Rev* \* Jan 30-92; Met. R. subway construct. *E News* \* Dec 13-90, n *Sc Am Sup* \* Jan 3-91 *Genie Civil*
- Philadelphia**, feasibility of, Haupt *F Inst* Dec -88

**Railroads, UNION** Pacific, geography of eastern end, Ainsworth *R Gaz* May 4-**88**, report, Apr 26, traffic, July 5-**89**; U. S. and, com. reports, Feb 21, May 2, Oct 17-**90**, Oct 16-**91**; May 13; & Cen., driving last spike, Dillon \* July 29 *Scribner's* \* Aug -**92** UNITED States of Am., see Poor's Manual of R's, **88-92**, bk.; stats., ed. *Eng* Aug 15; visitor's impressions, Nov 28-**90**; Poor's Man. review, Oct 7-**92**; decline in building, Greene *E Mag* Feb; in So. West., Coleman, insets \* Apr -**92**

*E News* No. West. states, inset map No 5 \* Jan 28; So. West., inset map 6 \* Mar 3; far West., colored inset map \* 31, 31; in '86-7, prog., inset map 9 and ed. \* June 16, 23, 23; in 1831 and record of 1887, Sep 8, 8; states east of Chic., col. inset map, ed. \* Nov 10, 10, 24; and English, compared in op. expenses, Dorsey, table. Dec 8; track laid in '86-7 and 8, col. inset map, ed. \* 29, 29-**88**

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*E News* smallest Am., Monson, Me. Feb 22; construct. in '90, col. inset map \* Mar 1, 1; construct., states east of Chic., col. inset map, ed. \* Apr 12, 12; Southern, col. inset map, ed. \* June 14, 14; No. West. construct., inset map \* Aug 2, 2; in '89, Poor's Man. bk. notice, 2; No. Minn. construct. Sep 13; So. West. construct., inset map, ed. \* 27, 27; Rocky mts. and Pac. states, ed. \* Nov 29, 29; construct. of '90, ed. Dec 27-**90**

*E News* in '90 and for five years, inset map, ed. \* Jan 3, 3, Aug 8; in '91, inset map \* Feb 28; states east of Chic., inset map \* Apr 11; in South, stats., inset map, ed. \* June 13, 13; and English, ed. July 4; No. West. construct., inset map \* Aug 1, 1; So. West. do., ed. \* Oct 3, 3; far West., inset map \* Nov 28-**91**

*E News* mileage laid in '91, inset map \* Jan 23; construct. of '91, inset map \* Mar 5, 5; states east of Chic., inset map \* Apr

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9; Southern, inset map \* June 23: prog. '91, Poor's Man. review, July 28, 28; No. West., inset map \* Aug 4; So. West. prog., inset map \* Oct 13; far West. construct., inset map, stats. \* Dec 8, 8-**92**

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*Eng* use of heavier, Sandberg, Feb 8 -**89**, steel, do. Aug 1, 1 \* 8; rail profile tracing ap., Schilling \* Sep 19 *R Gaz* \* Oct 10 -**90**; devel. Am. rail. and track, Watkins *Eng* \* July 1, 22 \* Aug 12 \* Sep 23 \* Oct 14, 21 -**92**

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*R Gaz* steel, manuf. and life, Delano, Aug 10; specs. for manuf., R. Hunt \* Oct 26; 80-lb., Mich. Cen. standard \* Dec 7 -**88**; specs., tests and inspection, cir. replies \* Jan 18, 25 \* Feb 15; heavy, Sandberg, 15; rail flangers, N. W. R. Club \* 15; breakages and splices, cor. Mar 8; form of rails and wheels, reports \* May 17, June 28; Goliath rail, Sandberg \* July 26, base plate, do. \* Sep 20; elec. welding of, Ries, Sep 27, cor. *St R J* Oct; steel, rolling, Nicholson *R Gaz* \* Nov 22; the Ham bay clip and detector bar \* Dec 20 -**89**

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FROG, spring, Penn. Steel Co., '88 *E News* \* Dec 15-**88**; the Monarch spring \* Apr 25-**91**. See also Rs, frogs - switches JOINTS, splice-bars and specs. for manuf., R. Hunt *Am Min* v 18 -**90**; Sandberg's *Eng* \* July 26-**89**; N. Y. Cen. *E News* \* Apr 21; Dill nut lock \* Sep 1; Foster bridge, Oct 6; Den. & Rio Gr. standard \* 13; Fisher br. imps. \* 27-**88**; adjust. panel, Pough. br. \* Feb 23; the Thomson \* June 1; rail joint question, ed. \* Dec 28-**89**

*E News* N. Y., L. Erie standard \* Sep 27; Weber joint tests, Roadmaster's Assoc. \* Dec 20-**90**; the Patterson \* Feb 21; B. & O. standard and 85-lb rail \* July 18; the Heath \* Sep 19; rail and splice-bars, N. Y., N. Haven standard \* Oct 3-**91**; splice-bar, Fall Brook Coal Co. \* Mar 5; Indian State R's \* Dec 29-**92**; fish plates tests at freezing temp., Buel *E Rec* July 4-**91**; Soule's *R & Eng* \* Oct -**89**; Connell's, Churchhill's pats. \* Mar -**91**

*R Gaz* 3-tie, with Bush's interlocking bolts, N. Y. Cen. \* Mar 30; Penn. R. \* Apr 6; L. Shore & Mich. So. 48-in. standard \* Nov 30-**88**; 3-tie angle splice, bush bolt, N. Y. Cen. Apr 12; 70-lb, Sav., Fla. & W. \* May 17; Goliath, Sandberg \* July 26-**89**

*R Gaz* and chair, Lond., Br. & So. C. \* Feb 7; splice-bars specs., R. Hunt, Aug 15; recent \* Sep 26; the Clark-Fisher \* Oct 17-**90**; track joints, table, Ellis, Aug 28-**91**; French, Mussy \* Apr 1; Scaife, Oct 14; the Price \* 14-**92**

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*E News* Reno system \* Apr 2; underground, plans, Broadway franchise sale, specs., inset, ed. \* Nov 24, 24, inset \* Dec 1-**92**; N. Y. prob., Steinway Commiss. report *E Rec* Oct 10, munic. ownership argus., Prout, Nov 21, Croes, 28-**91**; in cities, Haupt *F Inst* \* Jan -**88**; Wright *Pop Sci* Apr -**92**; N. Y. *R & Eng* Nov -**91**

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- Raymond**, Robert R., por (full) *E & Min* \* Dec 29-**88**
- Real estate**, Internat. Co. of Mex. & Lower Cal., n *E News* Mar 31-**88**. See also LAND
- Reed**, Edward M. *Am CE* v 26 -**92** *Am ME* v 13 -**92**
- Reed**, Samuel B. *Am CE* v 27 -**92**
- Refractory** materials, Egleston *Sc Am Sup* Sep 27, Oct 4-**90**. See also BRICK, fire-brick
- Refrigerating**, aut. system, Denver, Col., Hanks, insets *Am CE* \* v 24 -**91**; 35-ton machine, ammonia-absorption type, performance, Denton *Am ME* \* v 10-**89**, 75-ton do. \* v 12 -**91** *E & Min* \* May 16, 23-**91**; plant test, De V. Wood *Am ME* \* v 11 -**90** *E News* \* June 28-**90**; results of performance of, Denton-Jacobus, July 7 *Am ME* \* v 13 -**92**  
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- Refuse**, disposal, house *Eng* May 15-**91**; Watson (full) Sep 16 \* 30, and ed. *E News* Oct 6, N. Y. city report, 27 \* Dec 1; cremators *E Rec* \* Oct 8-22, Nov 19-**92**. See also CREMATORIES: MUNIC. eng.
- Reid**, David *Inst CE* v 110 -**92**
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- Reservoirs**, storage, appropriation, ed. *E News* Oct 6-**88**; waste weir capac. det., McAlpine, June 29-**89**; U. S. and Can., embankments and dams, inset \* June 21-**90**; covered, Swan R & Eng Oct *J N E Water W Assoc*, *E Rec* Oct 13, 20 -**88**

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- BOSTON, Mass., Waban Hill *E Rec* \* Aug 24, 31-**89**
- BUFFALO, N. Y., Prospect, new *E News* \* Jan 10-**91**
- COSHOCOTON, O. 320,000 gal. covered *E Rec* \* Aug 15-**91**
- EALING, Grand Junct. Co. storage *The Eng* Aug 24, 24-**88**
- EGYPT, the Raiyan impounding, Nile flood, Whitehouse *Eng* \* Sep 14-**88**, Sep 19-**90**; storage in, ed. Oct 16-**91**
- HALLINGTON, West, Henzell, inset *Inst CE* \* v 102-**90**
- HUDSON, Wis. covered *E News* \* Mar 15-**90**
- MANCHESTER works, inset *Eng* Feb 5-**92**
- NASHVILLE, Tenn., Parsons *E News* \* June 16-**88**
- NEBRASKA City, Neb., failure of *E News* \* Apr 19-**90**
- NEWTON, Mass. covered *E Rec* \* Apr 18-**91**
- NEW York, reservoir 'M,' inset *E News* \* Mar 22-**90**
- PARIS, France, Montmartre 3-story covered *E Rec* \* Aug 9, abs. *Inst CE* v 100-**90** *Sc Am Sup* \* Mar 8 *The Eng* \* Jan 17-**90**; Bechmann, abs. *Inst CE* v 105-**91** *An Ponts* Feb -**91**
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- TORCY, France *R & Eng* \* Jan -**90**
- TORONTO, Ont., Can., Rose hill embank. *E News* \* Aug 2-**90**
- WHEELING, Va. *E News* \* Mar 12-**92**
- Resins**, waxes and solid paraffins, Church (full) *Sc Am Sup* \* Apr 9-**92**
- Retaining** walls, for earthwork, Greene *E News* \* Dec 29-**88**; design of, K. Allen *E Rec* \* Nov 12, 19; old revetment wall, Montreal har., Sproule *R & Eng* \* Dec *R Gaz* \* Nov 18-**92**; M'Elroy, Nov 9-**88**. See also DAMS; HARBOR eng; R's, embank.; RESERVOIRS
- Retort**, mechan., with continuous feed and discharge, Haig *E & Min* \* Jan 31-**91** *J Soc Chem Ind.* See also GAS retorts
- Reynolds**, Edwin, por. *Cassier's* \* Mar -**92**
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- Rice**, culture in cen. China, Franklin *Sc Am Sup* June 8-**89**; hist., Proctor, Oct 10-**91**, manuf., do. July 9-**92**

- Richards**, Thomas M., por. *E & Min* \* Nov 29-**90**
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- Riddell**, Robert (full) *Inst C E* v 106 -**91**
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- River** motor, fluviatele *Sc Am Sup* \* July 28 -**88**
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*E News* pollution of streams, Hering, Aug 4 -**88**; comput. of discharges, G. Johnson, Sep 6 -**90**; river pollution in U. S., C. Brown, Mar 21, 28, abs. *Inst C E* v 103 -**91** *J Assoc E Soc*; self-purification of, Frankland *E News* Sep 5 -**91**; discharge obs. of large streams, Davison *E Rec* May 7; months' imp., Cortell report, Aug 27, Sep 3 -**92**; jetties for imp. estuaries, Haupt *F Inst* Apr -**88**  
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- AIRE & Calder nav. and canal waterway, Bartholomew *E News* \* Aug 30-**90**
- AVON imp. below Bristol, Chatham, insets *Inst C E* \* v 98-**89**
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- DANUBE imp. *E News* July 11-**91** \* Apr 2-**92**; the Sulina mouth of, Kuhl, Hartley append., insets, *Inst C E* \* v 91-**88**, inset \* v 106-**91**
- DELAWARE, obstructions in *Sci Am* Mar 16-**89**
- ELBE, ht. prediction of, in Bohemia and Saxony, Harlacher, Richter, abs. *Inst C E* v 91; regulation between Melink and Koniggratz, Oelwein, abs. v 92-**88**; Sax., flow measurements, 1886-7, Ringel, abs. v 95-**89**
- JAMES, imp. at Richmond, Va., W. Adams *E News* Nov 22-**90**.
- LOIRE, imps., Paris exhib., map *Eng* \* July 19, 26-**89**
- MAIN, canalization between Frankfort and Mainz, abs. *Inst C E* v 92-**88 Deut Bauz**-**87**
- MISSISSIPPI imp., flood hts. in reach between Helena and Vicksburg, Starling, insets *Am C E* \* v 20-**89**, keeping within banks, do. *E Mag* \* Apr -**91**; impending disaster on, June, prob., Dutton, Aug, Starling \* Nov -**92**
- E News* connecting with upper lakes, Handburg, Feb 18-**88**; Gov't. protective works, mat, Memphis \* Oct 26; levee con-

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struct. Nov 9; bank protection \* Oct 26, Dec 14-**89**; flood of 1890, Harrod, Apr 5; Lower, protection from overflow, J. B. Johnson, 19-**90**; Sabine Pass imp., Turtle cor., Haupt *F Inst Aug -88*; hist., Redway (full) *Sc Am Sup* July 11, 18-**91** ODER, imp. at Cosel (Europe) *E News* \* May 3-**90** PORTLAND, W. T., imp., Freeman, inset *E Mag* \* Aug -**92** POTOMAC basin, hydrography of, Babb, discuss., inset *Am C E* \* v 27 -**92** RHINE reg. works, between Eltville and Oestrich, Imroth, abs. *Inst CE* v 92 -**88**; reg. at St. Gall, Wey, abs. v 103 -**91** RHONE, imp. of months of, Guerard, report abs. *Inst CE* \* v 101 -**90**. See also POWER, Rhone river at Geneva SEINE, lower, Suresnes locks and weir, Luneau, abs. *Inst CE* v 101 -**90** *An Ponts* \* v 18 -**89**; canalization of, abs. *Sc Am Sup* \* Mar 16 -**89** *Genie Civil* STEEPING and Wainfleet Haven imp. *The Eng* \* May 18-**92** SUSQUEHANNA floods, Raymond report *E Rec* Jan 23 -**92** WEAVER nav., Sauer *E News* Aug 30-**90**; Stoney's sluices, Manchester ship canal *The Eng* \* Jan 9-**91** WITHAM channel and outfall imp. works, Williams, discuss., inset *Inst CE* \* v 95 -**89** *The Eng* Dec 7-**88** YELLOW *E News* Mar 31-**88**

**Rivet** signs, uniform system of *E News* Jan 25, cor. Feb 9, symbols, cor. \* Mar 2, Seaman, cor. \* Apr 13-**89**; diag. \* Sep 15 -**92**

**Riveted** joints, on an angle, expts., Flint *Am C E* \* Oct 27-**92**; copper, strength *Eng* \* Apr 24; \* Dec 4-**91**; riveting tests, Buckholz \* Dec 6-**90**; diags. \* Feb 6-**92**; net section in, Cooper *R Gaz* \* Aug 22; plates, tests \* Oct 10-**90**; Allen (full) *Sc Am Sup* \* July 18-**91**; of max. strength, Nicolson *The Eng* Oct 19, Nov 9, 30-**88**. See also BOILERS, riveted joints

**Riveter**, Allen pneu. *Eng* \* Nov 23-**88**; Schonbach's hydr. \* May; hydr., 200-ton plant \* Feb 14, 14-**90**

**Road** engines, rollers *Cassier's* \* Aug -**92**; locom., Burrell *Eng* \* June 20; steam on common roads, McLaren, Nov 21 *The Eng* Nov 21 *E News* Dec 20; locom., Aveling & Porter \* June 28-**90**; traction, European experience, McLaren \* Apr 4; the Springfield steam roller, inset \* Nov 21-**91**; Burrell compound *The Eng* \* Dec 12-**90**; 8 h. p. compound \* Sep 11 -**91**

**Roads**, betterment of our highways, Shaler *Atlan M* Oct; and road rollers *Cassier's*\* Aug; our common roads, Potter *Century* \* Apr -92; highways and nat. prosperity, North *E Mag*\* Apr; good wagon roads, importance, Haupt, June; Europe and Am., Potter \* Aug; wagon, future, Claypoole, Oct -91; convict labor in road making, Roberts, July -92; *E & Min* Apr 16, Mundin, Baker, 23-92; and pavements, Love, bk. n July 12-90 *E Rec*

*E News* valuation of road metal and setts for paving, Stock, Sep 22 *The Eng* Aug 31-88; country, in France, construct. and maintenance laws *E News* Feb 6, 23, Mar 2; country, legislation in Pa. Apr 6; construct. and repair of, London, Strachan, 13; good, value of, May 18; common, N. Jersey law, July 27; Am. legislation, bk. n Dec 7-89

*E News* country, notes, Downing, Feb 8; foreign highway construct. and maintenance, 22, Mar 1, 15, 29; maintenance, Roads Imp. Assoc., Lond. \* Aug 16; repair and maintenance of, England, Sep 13; road work in Richmond Cty., N. Y. Dec 13-90; country, money value of good, report, Feb 7-91

*E Rec* road making, Herschel (prize treatise) Mar 9, Apr 20, 27, May 4, 11; Greene, Aug 10 *Harper's W* Aug 10, 17; good, Pope *E Rec* 31, Shaler, abs. Nov 9 *Scribner's*; Bridgeport macadam, North *E Rec* Dec 28-89

*E Rec* resist. to traction, Hering, Jan 25; Penn. highways report, Feb 15; construct. and maintenance, Thompson (prize article) Mar 29, Apr 5-19, Pritchard, 19, 26, May 3, com. comments, 10; main, maintenance, Hooley, Aug 10; machinery, cost of, Oct 4-90; European sts. and highways, Dec 12; Brookline, Mass. macadam, contract, 19-91

*E Rec* county, construct. and repair, Owen, Jan 30 *Sc Am Sup* Mar 12 *E News* Feb 13; road across a marsh, Waite cor. *E Rec* Feb 20; highway roller repairs, French system, Durand-Claire, Mar 5, Bacot, cor. 19; road making in eastern Mass., McClintock, 26; administration of French highways, Neff, Apr 16; Telford road making, Lenox, Mass. \* 30; instruction in highway eng., C. Allen, June 11, July 2, 23, (full) *Soc Arts Mass* -91; highway construct., disputed points, Owen, Nov 19 -92 *Am C E*

*Inst C E* roadways construct. across peat bogs, Schacht, abs. v 104 -91; highway, location, ed. *R & Eng* \* May -90; sections, Prov., R. I. \* July; Janvier *Sc Am Sup* Feb 27; legal

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- responsibility for defective highways, Bly *St R J* Mar -**89**; Brighton foreshore imp. *The Eng* July 12-**89**. See also MUNIC. eng; PAVEMENTS; STREETS
- Road** vehicles, draught and haulage of *Sc Am Sup* \* Dec 5 *The Eng* \* Oct 16, cor. Dec 4 \* 11, 25-**91**
- Roanoke**, Va., survey of *E News* \* Jan 9 \* June 23-**92**
- Roberts**, Peter *Inst C E* v 96 -**89**
- Robertson**, Henry *Inst C E* v 93 -**88**
- Robertson**, James (full) *Inst C E* v 99 -**90**
- Robinson**, Moncure (full) *Am C E* v 26 -**92**, n *R Gaz* Nov 13-**91**
- Robinson**, S. S., por. *E & Min* \* Apr 11-**91**
- Rock**, drilling machine, hydr. *Eng* \* Feb 17-**88**; Dubois' boring machine, Paris exhib. July 12-**89**; M'Culloch's drill, Rio Tinto \* Sep 12-**90**; drills, Carbutt & Davey, Mar 27; and ore breaker, Gates I. Co., Chic. \* June 19-**91**; and ore crusher, Brennan *E News* \* Oct 18-**90**; removal under water without explosives, Lobnitz, inset *Inst C E* \* v 97 -**89**. See also DISINTEGRATOR; DRILLS; MILLS; QUARRIES; STONE and names of rocks
- Roe**, John P. *Inst C E* v 98 -**89**
- Roehricht**, Richard H. O. *Inst C E* v 106 -**91**
- Rogers**, William *Inst C E* v 95 -**89**
- Rolling** mill engines, reversing, Krupp works, Essen, Ger., inset *Eng* \* Sep 5-**90**; details \* Dec 4-**91**; 10,000 h.p., Jarrow *The Eng* \* Aug 9-**89**
- Rolling** mills, Simond's universal *Eng* \* May 25 *Sc Am Sup* \* May 5-**88** *Iron Age*; 15 in. 3- high blooming, Lack. I. & C. Co., Scranton, Pa., inset *Eng* \* Jan 23; rolling fluid metal, H. Bessemer \* Oct 9-**91**; failures of chilled iron rolls, Winder \* Oct 21-**92**  
*E & Min* construct. of passes in rolls for reducing metals, Hewitt, Aug 25 \* Sep 1-**88**; Am., evolution of, R. Hunt *E News* Nov 28, 28, (full) *R Gaz* Nov 20-**91** *Am M E*; universal, for girders and cruciform sections, Sack *Sc Am Sup* \* Jan 7-**88** *The Eng* \* May 10, 17-**89**. See also STEEL, German works
- Rome**, excavs. in ancient, Lubbock *Sc Am Sup* Mar 22-**90**; dev. of capital at, Hemphill, Oct 1-**92**
- Roofing**, slates, strength and weathering qualities, Merriman, discuss., insets *Am C E* \* v 27-**92** *E & Min* Sep 24-**92**; paper for material *E News* Sep 21-**89**; roll tar paper manuf. (full) *Sc Am Sup* Sep 26-**91**; tiles glazing, terra cotta, etc. July 9-**92**

**Roofs**, det. of stresses in elastic systems by method of least work, Cain, inset (full) *Am C E* \* v 24-**91**; Cathcart st. station, Greenock R., inset *Eng* \* Mar 22-**89**; Fairfield works boiler shop, Govan \* Oct 3-**90**; July-Sep -**92**

*E News* 22d reg't. armory drill room, N. Y. \* Apr 13-**89**; truss failure, Troy, Ala., cor. \* May 9-**91**; trusses, coeffs. for figuring strains in, table \* Aug 11; 4-mile crib, Chic. \* Sep 15 -**92**

*E Rec* 12th reg't. armory, N. Y., inset \* Jan 7; truss, So. Brooklyn R. car shed \* Mar 17; a cantilever \* Aug 4; St. Paul church \* Oct 27; rink truss \* Nov 17-**88**; So. armory drill-hall \* Apr 20; armory, Cin., O. \* Dec 7-**89**

*E Rec* iron mill \* Jan 25 \* Feb 1-**90**; arcade, Cleveland \* Mar 21, 28 \* Apr 4; erection traveler, Newport News Ship Bld. Co. \* Apr 25; Charleroi plate glass works \* May 9; iron shop \* Aug 29; strains in trusses *Locom* \* May -**91**

*R Gaz* Westinghouse machine shop \* June 6; rational trusses Arajol, June 27, cor. *The Eng* \* Oct 24-**90**; roof water removal, Porter *Sc Am Sup* \* May 18-**89**; iron *St RJ* \* Aug -**90**; iron, So. Mahratta R. *The Eng* Oct 19-**88**; barracks at Aden, Aug 30, Sep 6-**89**; a rational truss, Graham \* May 16-**90**. See also BUILDINGS; EXHIBS., U. S. Columbian - U. S. Gov't. bld.; FACTORIES; MILLS; Rs, stations, etc.

AGRIC. bld., Chic. exhib. *Eng* \* Apr 29 \* May 6-**92**

ALLEGHENY County court-house *E Rec* \* Nov 10-**88**

CARLISLE Corp. markets *The Eng* Mar 30, Apr 13, 18-**88**

CHICAGO Auditorium trusses *E Rec* \* Nov 22, 29-**90**

DULUTH Union depot *E Rec* \* Feb 6 \* Mar 12, 19, 26 \* Apr 9, 23, 30 \* May 21-**92**

DUNDEE R. station, Caled. R., inset *Eng* \* June 28-**89**

EDINBURGH exhib., inset *Eng* \* Apr 11-**90**

FOUNDRY plant, the Worthington, Elizabethport, N. J. *E Rec* \* Apr 2-**92**

HORTICULTURAL bld., Columb. exhib. *Eng* \* Nov 11, 18, 25-**92**

MACHINERY Hall, Columb. exhib. *E Rec* \* Dec 24, 31-**92**

MADISON Sq. Garden bld. *E Rec* \* Jan 17-31-**91**

MANUF's bld., Columb. exhib., insets *E News* \* July 28 \* Sep 1, 8-**92**

OLYMPIA, Nat. Agric. Hall, erection, Read *Eng* \* Dec 28-**88**

PARIS exhib., Machin. hall, inset *Eng* \* June 1-**88**; blds. \* May 3-**89**

- Roofs, Penn.** R., Jersey C. terminal station *Eng\** Apr 1-**92**, train shed, inset *R Gaz\** Oct 2-**91**
- Transport.** bld., Columb. exhib. *Eng\** Dec 2, 9, inset *E News*\* 29-**92**
- U. S. Columb. exhib. blds. *Eng\** Oct 30, inset \* Nov 13-**91** *E Rec\** Aug; Gov't. bld. *Eng\** June 10-**92**
- Rope** driving power transmiss., and cable, best speed of, Cooper, discuss. *Am M E* v 9-**88**; two haulage systems, Norris *E Rec*\* June 27 \* July 18 *Am M E* \* v 12; C. Hunt \* v 12-**91** *E News* \* Nov 15-**90** *E & Min* \* Jan 31-**91** *E Rec* Nov 15 *Pwr\** Dec-**90**, Jan-**91**; Grimshaw *Cassier's* \* July, influence of longitude on, do. Oct; ed. *El Rev Lond* Sep 16-**92**; underground haulage, J. B. Smith *Eng\** Feb 17 \* Mar 2, 23; Otto system haulage \* Apr 6-**88**; Miller, diag. *E News* \* Dec 6 *The Eng* Dec 19-**90**
- Pwr* Seymour \* May-July \* Nov-**89** \* June \* Sep-**90**; at Willamette mills, Portland, Or. \* Jan-**92**; *Sc Am Sup* \* Mar 24-**88**; by manila ropes, Gregg \* May 24-**90** *J Assoc E Soc*; *Sc Am Sup* May 24-**90**; \* Mar 24-**88**; *St R J* \* Apr \* Sep-**90**. See also POWER transmission; TELPHERAGE
- Ropes**, manila and hemp, strength and power transmiss., Miller, diag. *E News* \* Dec 6; *The Eng* Dec 19; and hitches *E Rec*\* July 19-**90**; strength of, Duboul, abs. *Inst C E* v 92-**88**, do. expts., French *R Gaz* June 29-**88**. See also CABLES; WIRE ropes
- Ropes** Pass, Texas, Kent *E Mag* \* June-**92**
- Ross**, George H. *Inst C E* v 95-**89**
- Rotary** boilers connections *Locom* \* Aug-**90**
- Rotary** engines, ancient and mod., Jamieson *Cassier's* \* Feb-**92**; Brown's *El Rev Lond* \* July 10-**91**; duplex *El Rev* \* Nov 29, n *El Wld* \* Apr 12-**90**; the Rota *Eng* \* July 20; Lidback's vibrating *F Inst* Oct *R & Eng* \* Nov; Bullock *Pwr* \* Apr; Rigg's *Sc Am Sup* \* Mar 10-**88**; revolving cyl. \* Nov 8; *The Eng* \* Mar 7, valve gear \* Apr 25-**90**, \* Jan 23; hydr. winding with variable stroke \* Oct 16-**91**
- Rotary-piston** valve, engine governing by, Aldrich *Am M E* v 13-**92**
- Rotary** pumps, Johnson's *The Eng* \* July 3, boiler feeder \* Dec 25-**91**. See also PUMPS, rotary
- Rouen** port, France *Eng* \* Oct 11-**89**
- Routing** machine, Parry's *Sci Am* Mar 23-**89**

**Routledge, Thomas** *Inst C E* v 92-**88**

**Rowland, Henry A.**, por. *El Wld*\* Mar 9-**89**

**Royal Institution Soc.**, Lond. pro. *El Rev Lond* May \* June 12-**91**; *Eng* May 16, 23-**90**, May 22, 29, June 5-26, July 3, 10, Dec 18, 25-**91**, Jan 8-22, Feb 12, Mar 4, 11, 25, June 17, July 22, Aug 12, 19, Dec 9, 30-**92**; pors. members *Sc Am Sup* \* Sep 7-**89**; June 14-**90**

**Rubber**, india, properties, in Russian navy, Vladimiroff, abs. *Inst C E* v 109-**92**; *Sci Am* Apr 6-**89**; vulcanization of, Gerner *Sc Am Sup* Jan 4; \* July 12, Sep 6; indus., hist. (Hayward's expts.) Oct 18; vulcanization and decay of, notes, W. Thomson, Dec 6-**90**; supplies sources, Sherman, Feb 6; gathering in Amazon valley, Kerbey, Mar 19-**92**. See also GUTTA-percha

**Rundle, Cubitt S.** *Inst C E* v 100-**90**

**Russ, William** *Inst C E* v 104-**91**

**Russia**, commerce and mineral industries, ed. *Eng* Dec 25-**91**; diagonally through, ed. cor. *E News* Oct 11, 18-**90**

**Russian** sheet iron *Sci Am* Feb 2-**89**

**Ryan, Jeremiah** *Inst C E* v 107-**92**

**Sabine** Pass imp., cor., Turtle, Haupt *F Inst* May -**88**

**Sacre Charles R.** *Inst C E* v 98-**89**

**Safety lamps**, the Thorneburry *Eng*\* Nov 15-**89**; miner's, notes, Hughes *E & Min* \* Mar 28-**91**

**Safety valves**, lever (full) *Locom* \* July -**92**

**Sahara**, the, James *Locom* Aug -**89** *Sc Am Sup*

**Sails**, action of, Vogt, cor. *Eng* \* Oct 11 *Sc Am Sup* \* Dec 21 -**89**

**St. Louis**, Mo., pavements, Macklind *E News* Mar 14; topog. survey of, Connet, Oct 31-**91**; pub. works management, Jan 23; new growth of, Ralph *Harper's M* \* Nov -**92**. See also PAVEMENTS; SEWERS; STREETS; WATER-works, etc.

**Salida**, Col., inset *E & Min* \* Dec 21-**89**

**Salmond, John M.** *Inst C E* v 102-**90**

**Salt**, works, obtaining brine, Brush, Tully Pipe Line Co., N. Y., discuss., insets *Am C E* \* v 23-**90** *E News* July 5-**90**; the Petite Anse mine, La., Pomeroy *Am Min* \* Apr 17-**89**, Bolton *Sc Am Sup* July 28, Pomeroy \* Nov 10 *E & Min* \* Oct 6-**88**; manuf., Pick's system in vacuo \* July 12-**90**; wells, Onondaga, '90, Engelhardt, Feb 21-**91**; U. S. produc., do. Jan 2; manuf., China \* Feb 6-**92**

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*Sc Am Sup* from sea-water, Merrill, Apr 20; manuf. n Sep 7 -**89**; works, Cheshire, Apr 19; manuf. in vacuo, Nursey \* July 26; mines, Retsof, Greigsville, N. Y., Sheldon, Dec 20-**90**; N. Y. indus. \* Nov 14-**91**; *Iron*

**Salter**, Frank *Inst C E* v 96 -**89**

**Samoa** *Century* May -**89**

**Sand** pumping, dredging and Mersey bar, ed. *Eng* Apr 11-**90**

**Sandstone** indus., U. S., Day, Cens. bull. abs. *E & Min* July 4 *E News* 18-**91**

**Sanitary** engineering, Manchester, England, ed. *Eng* Sep 30; bad air in theatres. Montgomery *E Mag* May -**92**; san. sci. in the home, Richards *F Inst* Aug; safety in house drainage, Hoyt *Pop Sci* July; Bayles *Sc Am Sup* Dec 15-**88**; legislation, England, results, Calkins, inset *Tech Q* \* Dec -**91**. See also BUILDINGS; Health; MUNIC. eng; PLUMBING; REFUSE disposal; SEWERAGE

**Santoy**, John B. Austis du *Inst C E* v 96 -**89**

**Saw** machine, double band, for deep cutting *The Eng* \* Mar 8-**89**. See also BAND saws

**Scales**, comparison of binary and decimal, table *Locom* Dec -**88**

**Scarborough**. See HARBOR eng., Scarborough

**Scarlet** fever, etiology of, Klein *Sc Am Sup* Jan 21, Mar 17-**88**

**Schaufuss**, Erich C., Bowden *Am Min* v 17 -**89**

**Schiseophone** (flaws in metals) ap. *Sc Am Sup* \* July 5-**90**

**Schliemann**, Heinrich, por. (full) *Sc Am Sup* \* Feb 28, Manatt, 28-**91**

**Schmidt**, Bernhard *Inst C E* v 96 -**89**

**Schneider**, Henry W. *Inst C E* v 92 -**88**

**Schools**, engineering, plea for the printing press in, Hawkins *Am ME* v 9 -**88**; technical, of Am., Purdue Univ., La Fayette, Ind., Goss, pors. *Cassier's* \* Aug -**92**; Lond. Tech. Inst., Tunzelmann *Eng*\* Nov 2, inset 16-30 \* Dec 7, 21-**88**; Steven's Inst., Hoboken, N. J. \* June 7-**89**; Cornell Univ. & Sibley Coll. Aug 22; Finsbury tech. coll. Nov 21-**90**; Brown Univ., Prov., R. I. \* Sep 11-**91**; manual training *E & Min* Feb 1 -**90**

*E News* premiums for graduating theses, Jan 30; Mass. Inst. of Tech. July 14, 21; Cornell Univ. 28; Lawrence Sci. reorganization, Sep 22-**92**; education, value and drawing and hand-

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work in pub., Combes *F Inst* Sep -89; nat. hist. in elementary, Hensoldt, Jan.; and trade schools, J. Wilson, Feb - Oct -90; eng. Brit. dominions, bk. *Inst C E* -91

*Tech Q* Mass. Inst. of Tech., beginning, Munroe, May -88; sci. and tech., place of in Am. education, Walker, Dec -91; English composition in colleges, Carpenter, Oct -92. See also EDUCATION; ENGINEERING schools

**Schopenhauer**, Arthur, por. *Sc Am Sup* \* Apr 21-88

**Schwarz**, T. E., por. *E & Min* \* Aug 29-91

**Science**, Smithsonian Inst. reports, bk., Gov't Printing Office, Wash; is science disciplined knowledge, Varley *El Rev Lond* Jan 2, 9-91; prog. in '89 *E News* Jan 4-90

*F Inst* limits of scientific inquiry, Hensoldt, May; applied, possibilities of, O. Smith, June -91; notes, see *F Inst* files; recent Kropotkin *19th Cent* May, Aug, astron., Mars, biology, human muscle, Dec -92; circle of the sciences, Coleman *ut* Oct -88; scientific socs. of Italy, Cahall *Pop Sci* Nov -92

*Sc Am Sup* hist. of a scientific doctrine, Langley *Sc Am Sup* Oct 27, Nov 3-88; the man of sci., Thurston (full) Jan 2; natural relation to art, Du Bois-Reymond, Feb 20-92; beginnings of, Calkins *Tech Q* Apr -91; measuring earthquakes, ozone ap., Roy. Inst. pro. *The Eng* June 29-88

**Scott**, Michael (full) *Inst C E* v 104 -91

**Scott**, William B. *Inst C E* v 109 -92

**Scranton**, William H., Raymond *Am Min* v 18 -90, por. *E & Min* \* Oct 12-89

**Screen**, gyrating, Coxe & Salmon *Eng* \* Aug 30-89

**Screw bolt**, expts. with, McBride *Am M E* \* v 12 -91

**Screw propellers** (marine), effective area of screws, Jacobus *E News* Aug 3 *Am M E* \* v 11 -90; effic. as dependent on surface form of propeller, Durand \* v 13 -92; planing machine, Sunderland *Eng* \* Jan 27; expts., Andree \* Apr 13; blades material, Parsons cor. 20; Dickinson's \* 27 *Sc Am Sup* \* May 26-88

*Eng* life of, cor. \* Jan 25; model expts., formulas, Vogt cor. \* Nov 29-89; Howden, Apr 18, theory cor. May 2; Barnaby, May 16, discuss. inset (full) *Inst C E* \* v 102 -90; screw propul. and non-reversible engines, McGlasson cor. *Eng* \* Dec 18 -91; Barnaby, bk. review, Feb 26; effic., Froude \* May 6, dimens. \* 13; arrangement of surface, expts., Walker, Nov 4.

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effic. *Sc Am Sup* Dec 31, ed. and cor. Oct 28, Nov 4, 4-**92** *Inst M E*; physics of, Lowe *Sc Am Sup* May 2-**91**

*The Eng* Trew cor. Aug 24; ed. Dec 28-**88**; blades design, Fitz Gerald \* Aug 22 \* Sep 19; Mansel cor. Oct 31, 31-**90**; Vogt cor. \* Feb 6; Fitz Gerald cor. May 8; ed. July 17; Mc Glasson's reversing \* Oct 23; typical (shapes) \* Dec 25-**91**; Mansel cor. Dec 23-**92**

**Screw pile pier** at Kotonon, in Africa, inset *E News* \* Oct 6-**92**. See also PILES, screw

**Screws**, perfect, prob., Rogers *Am M E* \* v 12-**91**; wood, rolled *Eng* \* Nov 22-**89**; Lieb's ball bearing *The Eng* \* Nov 28; anti-friction, Dec 12-**90**; screw threads, Gill *F Inst* \* Mar -**88**, Forney *R & Eng* \* Oct -**90**. See also SCREW bolt

**Sea-beaches**, Shaler *Scribner's* \* June -**92**

**Sea-sickness**, mechanics of, Greenhill *The Eng* Aug 28-**91**

**Sea-walls**, asphalt in, Ambrose *E Rec* May 16-**91** *Am C E*. See HARBOR eng., sea-walls

**Sea-water**, effect of oil on disturbed water, Beynon *Sc Am Sup* Mar 1-**90**. See also OCEAN

**Seeret** service, elec., individual telegraph call *R Gaz* \* Aug 28 -**91**

**Seismograph**, Ewings duplex pendulum (vibration measurer) *Eng* \* Feb 22 *Sc Am Sup* \* July 20-**89**

**Sellers**, Coleman, por. *Cassier's* \* June -**92**

**Sennett**, Richard *Inst C E* v 107 -**92**

**Sewell**, John *Inst C E* v 92 -**88**

**Sewerage** and sewers, sewage disposal, C. Allen, discuss. *Am C E* v 18-**88**; and rainfall, relation between and discharge in populous districts, Kuichling, discuss., insets (very full) \* v 20 -**89**, abs. *Inst C E* v 97 -**89**; sewage purification by electrolysis, Webster *El Rev Lond*\* Oct 11 *E News* Apr 18, Berlin, Oct 26 *Sc Am Sup* \* May 4 \* Nov 23-**89**, Apr 25-**91** *The Eng*\* Mar 29-**89**; purific. by microbes, ed. *Eng* Oct 7-**92**; disposal, England, T. K. Thomson *E Mag* Sep -**91**; disposal in U. S., Rafter \* Jan -**92**

*E News* formula for vel. of flow in sewers, Hering, Dec 15-**88**; the Galvin flusher \* Jan 19; the Hardie plant \* Feb 2, formula, Hartford, 16; proportion of rainfall reaching sewers; Kuichling, Mar 16-30; discharge tables, Gloyne, Apr 6; gauging,

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Kuichling, 13, 27, May 4; test borings by hand labor, outfit \* May 11, Guthrie cor. \* 25; experience in sewage, Lindley, July 6-**89**

*E News* Ford's ventilator \* Aug 2; systems in U. S. and Can., ed. 23; trench excavator \* Sep 27; frame for cleaning \* Nov 1-**90**; sewage precip. tanks, upright, Baumeister \* Feb 7; pipe and brick sewers cost and manholes and catch basins, Troy Imp. Commiss. report, table, Oct 24-**91**

*E News* systems of N. E. states, table, ed. May 19; sewage disposal of isolated dwellings, Parry, June 2; ground water conduit \* 30; sewage purific. in Am. July 14; Shone system \* Aug 4; flow in pipe sewers, diag. \* Aug 11-**92**

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- SOUTH Framingham, Mass. works *E News* Nov 23-**89**; sewage purific. Aug 11-**92**
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- WORCESTER, Mass., disposal works *E Rec* \* Mar 21-**91** *E News* \* Nov 16-**90**; sewage purific. July 28-**92**
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- Shafting**, keying, Woodruff system *Eng* \* Sep 19-**90**; strength of, A. L. Jones cor. \* Nov 20-**91**; hollow, formula and table *The Eng* \* Dec 30-**92**
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- Shearing** machines, for 30 by 9 in. slabs, Clyde Br. steel works, inset *Eng* \* June 8-**88**; heavy rail and plate \* July 18-**90**; Wicksteed's hot *The Eng* \* Oct 2-**91**
- Shear-legs**, ship's, 120-ton, Clydebank Ship Bld. yard, Glasgow, inset *Eng* \* Dec 28-**88** *E & Min* \* Feb 9-**89**; 130-ton, Fairfield yard, Govan, inset *Eng* \* Sep 19-**90**; 120-ton hydr. triple power, Port of Marseilles, Richou *Sc Am Sup* \* June 2, abs. *Inst C E* v 93 -**88** *Genie Civil* \* v 12 -**88**; 80-ton, Globe I. works. Cleve. *R Gaz* \* Nov 11-**92**. See also **SHIP-building**
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- Spelter** produc., Europe and U. S. *E & Min* Mar 31-**88**, '90, Mar 28-**91**; indus. '89, Jan 4-**90**, Jan 3-**91**
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- Sperry**, Elmer A., por. *El Wld* \* June 15 **89**
- Spice**, Robert P. *Inst C E* v 97 -**89**
- Spike** forging machine, the Burton elec. system *El Eng* \* Jan 27-**92** *El Rev* \* Sep 13-**90**
- Spikes** and drift bolts, holding power of, expts. *E News* Sep 26-**91**. See also R's spikes: TRACK
- Spindles**, spinning, Stockton Bates' support for, com. report *F Inst* \* Aug, tests, Webber, do. Sep -**90**
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- Stamp** cancelling and post-marking machine, the Ethridge *E News* \* Oct 5-**89**
- Standards**, J. W. See *Am M E* v 10-**89**. See also WTS. and measures
- Standfield**, John *Inst C E* v 101-**90**
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- Stanley**, William, Jr., por. *El Eng* Aug 20-**90**
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- GAUGES**, recording pressure, Bristol *Am ME* \* v 11 -90 *E News* \* Dec 7-89 *The Eng* \* Jan 23-91; Calkins *Cassier's* \* Apr -92
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**GLENGYLE** and Glenshiel *The Eng* July 5, 5-**89**  
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**HYGEIA**, paddle pass., inset *Eng* \* Nov 7 *The Eng* \* Oct 17, in-  
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**IBEX**, Great West. R., twin-screw *The Eng* Sep 18-**91**  
**INDIA**, engines and boilers, inset *Eng* \* May 1-**91**  
**IONA**, trials, Kennedy report *The Eng* May 8, 22-**91**  
**ISLANDER**, Napier, inset *Eng* \* Sep 28-**88**  
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**LYNX**, Antelope and Gazelle, Great West. R., inset *Eng* \* May  
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**MAJESTIC**, White Star line *Sc Am Sup* \* Oct 11-**90**  
**METEOR**, trials, Kennedy report *The Eng* \* May 3, ed. 10, *Inst  
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**NOMADIC** and Tauric, White Star, inset *The Eng* \* July 24-**91**  
**NORMANNIA**, Hamb.-Am. twin-sc. *Eng* Jan 31, inset \* Aug 29  
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**OPHIR**, Orient Stm. Nav. Co. (Austral.), twin-screw *Eng* \* Dec  
 11 *The Eng* Sep 18, inset \* Nov 20, 20-**91**  
**PARIS** and Rouen, Lond. & Br. R., Channel *Sc Am Sup* \* May  
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**PENINSULAR**, Penin. & Oriental *Eng* Dec 7-**88**  
**PERU**, Pac. Mail, launching curves of *The Eng* \* Sep 16-**92**  
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**PURITAN**, Fall River line, steel, elec. light decorative features *E/  
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**RE Umberto** *The Eng* Nov 2-**88**  
**ROME**, Penin. & O., lengthening *The Eng* Oct 2-**91**  
**RUAHINE**, New Zeal. Shipping Co. *The Eng* \* Apr 1-**92**

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- SULTAN, raising of, ed. *The Eng* Sep 13-89
- TARTAK, speed trial, Mansel, n *The Eng* Dec 23-87, June 29-88
- TEUTONIC, White Star, inset *Eng* \* Dec 19-90, cor. Jan 9, (full)  
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- ULUNDA, raising *The Eng* \* Mar 27-91
- VILLE de Douvres, trial, Kennedy *The Eng* \* May 13, 20-92  
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- WAESLAND, Red Star line *Eng* Dec 20-89
- WHALEBACK, 'C. W. Wetmore,' Am. cargo *Eng* \* July 31-91,  
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- Am M E* plates, injury by punching or shearing, Hawkins;  
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- Am Min* Bess., sulphur in, Cabot; open-h., physical and chem. equations of proc., Campbell (full); German works and rolling mills, notes on imps., Daelen *E & Min* \* Nov 8, 15-90, inset *Am Min* \* v 19: Bess. proc., notes on, Howe (very full);

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*Inst C E* open-h., use and testing for boiler-making, Goodall, discuss. (full) \* v 92; Terni works, Italy, ed. *The Eng* Nov 23, machin. of, Savage, insets *Inst C E* \* v 93; mild, effect of rolling and wire-drawing, H. Allen \* v 94 -**88**; Bess. proc. at Nischnje Saldensk, Ghrum-Ghrzhimailo, abs. v 100-**90**

*Inst M E* and steel guns, Chernoff, July **91**; U. S. produc. '87 *Locom* Mar -**88**; phosphorus det. in, Dudley *R & Eng* \* Dec -**92**; bars, plain and twisted, rel. strength tests, Gilmore *R Gaz* Mar 15-**89**; cost and st. rails, Wright report, Feb 20; castings, good and bad, ed. \* July 24-**91**

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*The Eng* Bess. converter controlling ap., Watts \* June 6; U.S. produc. Nov 14; basic open-h. manuf., Davis, Dec 19-**90**, dis. Jan 23; Dowlais works, at Cardiff, England \* Nov 13-**91**.

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**Tar** furnace, Anderson *Sc Am Sup* \* Feb 11-88

**Tariff** and the constructive arts, Thurston *Cassier's* Jan -92

**Taxes**, U. S. *E News* June 1-89

**Taylor**, John *Inst C E* v 109 -92

**Teaching** of science, com. report (full) *Sc Am Sup* Jan 25, Feb 1-90. See also SCHOOLS; SCIENCE

**Technical** Soc. of Pac. Coast, Geldern, pors. *Cassier's* \* Oct -92

**Telegrams** and storms, Slingo *El Rev Lond* Jan 23, 30, Feb 6-20-91

**Telegraph** *El Eng* wire, hard drawn cop., durabil., Maver, Apr -88; line adjust., Delany \* Dec *El Rev* \* Nov 30 *El Wld* \* Apr 27 \* Nov 30, multiplex, new sys., Patten's (full) *El Eng* \* Mar-89 \* June 18; circuits, Jones' main office \* Dec 17-90; writing tel. \* June 3-91

*El Eng* mod. Am. ap., F. Jones \* Mar 30, May 25 \* June 22 \* July 27 \* Aug 3, 17; wire joints, breaking strain in hard drawn cop., Jones, June 1; type, the Am. n \* July 27; cable, Burke relay and transmitter \* Dec 7-92

*El Rev Lond* R. survey system, Gilbert \* May 18; transmiss. limit, Moon, Aug 10; submar. cables and ocean temps., Bright, Nov 16-88; cables, of world, Feb 15; Siemens's recording ap. for compact Morse writing \* Mar 8; Submar. Co. 29; ocean probs. and conditions, Apr 5; trans-atlan. cable routes \* Aug 2, map *El Wld* \* July 27; high vs. low speed, finan. compar. *El Rev Lond* Aug 16, Linckens *El Rev* Sep 7; cable manuf. early hist. *El Rev Lond* Dec 13-89

*El Rev Lond* submar. cables, aut. reversal signaling on \* Feb 7; protection, lightning guards, Lodge \* May 16-30; elec. curs. in conductors, Bennett \* July 25; sub. cables, interrupts. and repairs, '88-89. table, Aug 22-90; prog., '96, Feb 6, in England,

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Preece, Sep 18; sub. cables, India-rubber core in \* Mar 20; pictorial \* Dec 4-**91**; ap. constants, Moon, Apr 29; sub. cables, double differential relay, Raymond-Barker \* July 22-**92**

*El Rev* hist., Vail May 5 *Century* Apr -**88**; cables, broken ocean, Oct 5; multiple, synchronism in, Morse, Nov 16; cable manuf. hist., Barrett, 23-**89**; tournament (fast sending) \* Apr 12, 19; curs. in conductors, obs., Bennett \* Aug 23; writing, prins. of, Morse \* Nov 15-**90**

*El Rev* and telephone, inventors of, Gray addr. Apr 18 *El Wld* 25 *E Mag* June 20 *Sc Am Sup* 20; and pat. stats., Brit. *El Rev* June 27; musical, Hachenberg, por. \* Nov 14; a pub., Hale, Dec 5-**91** *Cosmopol.*; in Am. *El Rev* Feb 20-**92**

*El Wld* dynamo-elec. machines in, West. Un. bld., Maver \* Feb 11, 18; quadruplex, imps. do. \* May 19, 26 \* June 2, cor. \* Oct 27; trans-pac. cables, proposed, table, July 14; Gray telautograph \* Aug 11; with pulsatory and undul. cur. sigs., Maver \* 25 \* Sep 8, 22 \* Oct 6; and telephony, Jacques' simul. system \* Nov 17-**88**

*El Wld* ocean probs. and conditions, Weatherbee \* Jan 26; imperfect earth in circuits, phenom., Kenelly \* Mar 16; line construct., Paris exhib. \* Nov 9-**89**; quadruplex, Healy \* Jan 18; submar., Webb (full) Mar 1, (full) *Sc Am Sup* Apr 19; fast sending contest *El Wld* \* Apr 19; signaling across rivers, India, Melhuish \* May 10; nationalizing, Wiman, Dec 30 -**90**

*El Wld* electric., galv., mag. and teleg., chron. hist., Mottelay (very full) \* Apr 18-Dec 26-**91**, Jan 2-Feb 27, Sep 3, pors. \* 10-Oct 22-Dec 31 etc. -**92**; the phonopore, Langdon-Davies *Sc Am Sup* \* May 18 *The Eng* \* June 21-**89** *El Wld* \* Mar 7; and teleph. indiv. selection on elec. circuits call sys. \* July 11; Gov't., Rosewater (full) Dec 12, Gov't. control, Foote, 19 -**91**

*El Wld* pictorial, Trotter \* Jan 16; the Wentz line adjuster, Rosenbaum \* Feb 20; lines earth cur. disturbs., Finn \* May 14; cable relays, Judd \* Nov 5-**92**; multiplex, the phonophore *Eng* \* Apr 19; at Paris exhib. \* Aug 16, 23 \* Oct 11, Post Office, Oct 25, Nov 1-**89**

*E News* the Am. inventors of the, ed. Apr 14, birth of the elec. 21; the Finley helio-teleg. 28-**88**; trans-Atlan. cable lines \* Mar 29; the world's lines, Oct 25; cables, internat. sys., Henniker, 25-**90**

**Telegraph**

*F Inst* the writing, Gump, Oct -88; cable, Delaney \* July, (full) *Sc Am Sup* \* Aug 31 \* Sep 7-89; foreign curs. balancing effects, Fletcher *Inst C E* \* v 94-88; sub. cables resist. measurement, Rouillard, abs. v 95-89; sub. Pac. cable, projected *Locom* Nov -91; Gill-Alex. indiv. call *R Gaz* \* Mar 18; secret service indiv. call \* Aug 28-91

*Sc Am Sup* Morse and first line, Feb 25-88; trans-atlan. cable lines \* Apr 26-90; transmiss. of messages through the air without wires, Trowbridge \* Feb 21; between Great Brit., Europe, Am. and the East, Niven \* Mar 28; first message, Vail, Nov 14-91; of to-day, Buckingham *Scribner's* July -89

CHINA, and R's, Hitchcock *E News* \* Nov 17-92

DELANY'S sys. of private line *El Eng* \* July 20-90; aut. *El Wld* \* Feb 2; line adjusting *R Gaz* \* Nov 1-89

EUROPE, Gov't. tels. of, Rosewater *El Eng* Dec 9, dis. 16; Niven *Sc Am Sup* \* Mar 28-91

MERCADIER multiplex sys., abs. *Inst C E* v 106 -91

PARIS-New York Co. *El Rev Lond* July 29-92

PATTEN's multiplex sys. *El Wld* \* Jan 26, (full) \* Feb 23, dis. Mar 9-89

POSTAL, Brit. Post Office *El Rev Lond* Apr 5-89; *El Rev* Dec 5, Gov't. control, Rosewater, dis. (full) 12; Great Brit. sys. *The Eng* \* Dec 18-91. See also POSTAL telegraph

SPECTRO-tel, Dresing *El Rev Lond*, *El Wld* \* July 21 *Sc Am Sup* \* Aug 4-88

STENOTELEGRAPH, the Cassagnes (stenography at a distance), Chenut *El Wld* \* July 19 *Sc Am Sup* \* Aug 16-90

TYPE printing, Wright & Moore's *El Rev Lond* \* Mar 1 *Sc Am Sup* \* June 8-89 *Iron*

WESTERN Union Co., U.S., reports *El Eng* Nov -88, Dec -89, N. Y. equip. (full) Jan 27-92; reports *El Rev* Oct 19-89, Oct 22-92

WEST Indies, competition map *El Rev Lond* \* Dec 26-90

**Telegraph** Engr. Soc. pro. *El Rev Lond* Jan 13-27, Feb 3, 17, 24, Mar 2-16, 30, Apr 20, 27, May 4, 18, 25, June 18; *Eng* May 25-88

**Telegraphophone**, the Wheless *El Wld* \* Sep 14-89

**Telemeter** system *El Wld* \* Sep 21-89; Fiske's (marine dist. instrum.), Brylinski, abs. *Inst C E* v 106 -91 \* *An Telegr* -91; Gautier's pocket (rapid dist. measuring), Robbins *Tech Q* \* May -89

**Telephone** *El Eng* transmitting speech by interrupted elec. curs., Kintner \* Jan *El Rev Lond* \* Jan 20, 27; and electric light and power circuits, elec. relations, Lockwood *El Eng* Oct -**88**; interference cases (very full) Mar; induced cur. strength with magneto-teleph. transmitter, Cross, May -**89**

*El Eng* induction \* Jan; eng., Carty, May 21 *El Rev* May 24; spec. induc. capac., Jacques *El Eng* Oct 1-**90**; inductive disturbs. in circuits, Carty \* Mar 25, dis. Apr 15 *El Rev Lond* Apr 10 *El Rev* \* Mar 28, *El Wld* \* 28, dis. \* Apr 11 *Sc Am Sup* \* May 9, expts., Kennelly *El Eng* \* May 6, 13-**91**; signals, selective or indiv., Lockwood \* June 8 *El Rev* \* June 18 (full) *El Wld* \* 11; eng., Webb *El Eng* \* Sep 7; connecting stations with exchange office by single line, Zetsche \* 21-**92**

*El Rev Lond* batteries, Pickernell, Oct 19 *El Rev* Sep 15-**88**; telephony, Hibbard *El Rev Lond* Oct 18; induction, Carty \* Dec 6, dis. *El Rev* \* Nov 30 *El Wld* \* 30 *Eng*\* Dec 20-**89**; French *El Rev Lond* Jan 10; exchange construct., Pickernell, Oct 17-**90**; receiver, influence of strength of magnet in, Cross \* Feb 20; telephoning great cities, Bennett (full) \* Sep 4, 11, 11, ed. Oct 2, 16, Nov 13 *Eng* \* Sep 11; and telegraphy, prog. in England, Preece *El Rev Lond* Sep 18-**91**; domestic telephs. \* May 13-27-**92**

*El Rev* limits of speaking teleph. lines, Wietlisbach, May 18; Paris exhibit, Sargent, Sep 21, convention, 21; Enzmann's telephonic relay and phonopore \* Nov 2-**89**; principles underlying acoustic telephony, Cross, Feb 8; convention (full) Sep 20; Co's corporate organization, Hall, 20; Root's (box) aut. pay station \* Nov 22-**90**; the McCluer toll-box \* Jan 24; telephony, new method of study, Cross, Feb 7; and telegr., inventors of, Gray addr. Apr 18 *El Wld* 25 *E Mag* June 20 *Sc Am Sup* 20; first exchange, New Haven, Ct. *El Rev* Jan 2; ten years with, Barrett \* Feb 20-**92**

*El Wld* telephony, Touanne, Sep 14-**89**, duplex, Oct 23-**86**, Jan 4-**90**, Barrett \* Jan 18; submar. cables for long dist., Preece, Oct 4-**90**; disturbs., Kennelly, Apr 11-**91**; U. S. indus. June 18; Co. operating, Foote, July 9-**92**

*E Mag* chat with Europe, Webb, Apr -**91**; indus. future, do. Mar -**92**; teleph.-equation, Madsen, abs. *Inst C E* v 95 -**89**; effects, intensity and equality, Mercadier, abs. v 108-**92**; elec. boxes *Sc Am Sup* \* Jan 21; interferences of dynamo curs., McCluer, Oct 13-**88**; telephone girl, Nelson, Feb 20 **92**

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*Tech Q* magneto transmitter, strength of induced cur., Cross \* Feb -89; magneto receiver, influence of strength of magnet, do. \* Nov -90; telephony, studies in Rogers lab. of physics, Mass. Inst. Tech., do. *Soc Arts Mass* -89; new method of study in, do. -91

ALBANY, Hudson river Co. *El Rev* \* Dec 10-92

AM. Bell Co., report *El Eng* Apr, decis. May -88; reports *El Rev* Apr 7-88, Apr 6-89, Apr 5-90, Apr 11-91, Apr 9-92; U. S. vs., pat. decis., law (full) *El Wld* Mar 24, 31, (full) *El Rev* Mar 31, May 5 *Sci Am* Nov 24; reports, Apr 7-88, Apr 6-89, Apr 11-91

BELL's water-jet transmitter, Tunzelmann *El Wld* \* Aug 11 *Sc Am Sup* \* Sep 8-88

BERESFORD, the *El Rev Lond* May 27, June 10-92

BOSTON exchange *El Rev* \* Aug 1-91

COLLIER audible *El Wld* \* July 18-91

DENVER, induction and interference with service *El Eng* Apr 16 -90; system *El Rev* \* Feb 9-89

DETROIT Exchange Assoc. *El Eng* Sep 17-90

EDISON's carbon pats. *El Rev* \* May 14 *El Wld* \* 14-92

GRAMOPHONE, Berliner *El Eng* \* Dec 31-90 *El Wld* \* Jan 3-91. See also GRAMOPHONE

HOWARD's ap. *El Rev* \* Oct 31-91

JACQUE's sys. of simul. telegr. and telephony *El Wld*\* Nov 17-88

LONDON-Paris, Eng. Channel submar. line, Preece *El Rev Lond* \* Aug 28; Webb *El Rev* Mar 28, Apr 11, Preece \* Sep 26 *El Wld*\* Oct 3; *Eng* Mar 20, Preece, Sep 4 *Sc Am Sup* \* Oct 3 -91 *El Eng*

LONG distance, 950 miles, Dickson *Cassier's* \* Nov; Webb (full) *El Eng*\* May 4, 11; N. Y. - Chic. line, eng. details, Wetzler \* Dec 14; 1,000 miles by, N. Y. - Chic., pors. *El Rev* \* Oct 29; Neilson *El Wld* July 9; *Sc Am Sup* Jan 9-92; *Locom* May -88 *El Rev*

MICROPHONE, evolution of, Tanner *El Wld*\* Dec 13 *El Rev Lond*\* Nov 21; transmitter, excursion of electrodes, Cross, Oct 31 *Tech Q* Aug *El Rev* Nov 1-90 *Tech Q*; Blake contact expts., Patterson *El Rev* May 5 *Tech Q* Feb -88; Barrett *El Rev* Mar 19-92; transmitter, Berliner pat. (full) *El Wld* \* Nov 28, 28-91; cur. strength, Sabine, Cross *Tech Q* Feb -89. See also MICROPHONE

- Telephone**, NAT. Exchange Assoc. pro. *El Eng* Oct (full) *El Rev* Sep 15-**88**; *El Rev Lond* June 7-**89**; (full) *El Wld* Sep 15-**88**, Sep 21-**89**, Sep 20-**90**  
NEW England Teleph. & Telegr. Co. reports *El Rev* May 18-**89**, May 17-**90**; quarters *El Wld*\* Aug 1-**91**  
NEW York city, service *El Eng*\* Sep 10-**90**; underground wire work *El Rev*\* Mar 16-**89**; Met. Exchange \* Sep 13-**90**, station *Sci Am* Mar 30-**89**  
PHILA. Bell Co. plant (full) *El Eng*\* Feb 10, report, Apr 6-**92**  
PULSION, the *Eng*\* Dec 6-**89**  
ROSEBRUGH duplex system *El Wld*\* Jan 4-**90**  
SWEDEN & Norway *El Rev Lond* Aug 1 *Eng* Dec 12-**90**  
SUTTON's system *Sc Am Sup*\* Feb 28-**91**  
SWITCH-board, Vail & Seely's *El Rev*\* July 14-**88**, McClure's multiple \* Feb 21-**91**; switching, Wordingham, inset *Inst CE*\* v 100-**90**  
UNITED Co., an. meeting *El Rev Lond* July 6-**88**, report, June 7-**89**  
VAN Size's exchange system *El Wld*\* Dec 8-**88**  
Tele-photography, Sutton *El Rev Lond*\* Nov 7-**90**  
**Telescope** grinding machine, Common's 5-ft. mirror (full) *Eng*\* Oct 28 \* Nov 4, 11, inset, 18, 25-**92**  
**Telescopes**, hand, for stadia work, Richards *Am Min*\* v 20-**92**  
*E & Min*\* May 14 *Sc Am Sup*\* June 11-**92**; object glasses *Sci Am*, *Eng*\* Jan 6; for stellar photog. \* Apr 27; astronom., clock driving ap. for, Grubb \* Oct 5 *The Eng* Aug 10-**88**; hist., Holden *Sc Am Sup* Jan 21; Manchester exhib.\* 28; great, of world, Rees, Mar 3-**88**; pyrometric \* Mar 1-**90**; Lick equatorial 36-in., Keeler *The Eng* July 6-**88**  
**Telpherage**, two rope haulage systems, Norris *Am M E*\* v 12-**91** *E & Min*\* Aug 8, 15; aerial wire ropeways, Pohlig, inset (full) *Am Min*\* v 19-**91**; cable transfer for R. cars, Spilsbury \* v 20-**92**; and elec. R's of Edinb. exhib., Manville *El Rev Lond* Oct 17-**90**  
*El Rev* elec. transport., Parcell \* Aug 9; double track elevated elec. wire road, for mining and mills *El Wld*\* Jan 4-**90**; Sprague elec. aerial tramway *E & Min*\* July 28-**88**; Lidgerwood suspen. cableway, Ogden mines, N. J. \* Oct 10-**91**  
*E News* the Portalelectric carrier, May 25-**89**; Suspen. Transport. Co., Chandler's pat. wire ropeway \* July 12-**90**; Plomo-

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sas wire ropeway, McIntire \* Mar 21 *Sc Am Sup* \* Feb 21  
*R Rev* the Garrucha aerial, Spain \* July 25 *R & Eng* \* Aug  
*Industries*; suspen. cableway at Austin dam, Tex. *E News* \*  
Nov 14-**91**; long span wire rope, Howland, Me. \* Apr 2  
**-92**

*Inst C E* Gourjon system wire ropeways, Gros, abs. v 93 -**88**  
*An Ponts* \* v 14 -**87**; Beer system, Raoult, abs. *Inst C E* v  
95 -**89** *Rev Mines* v 3 -**88** *Sc Am Sup* \* Dec 15 -**88**; Ayrton,  
Perry, Jenkins' at Glynde, England, Fernald *Pop Sci* \* July  
**-90**; wire rope transport. and transmiss. *R Gaz* \* Oct 7 -**92**

*Sc Am Sup* Otto pat. wire ropeway (full) \* June 22 -**89**,  
Gottesegen coll., Silesia, *The Eng* Dec 28 -**88**, inset \* Jan 25  
\* Feb 8, 8 -**89**; Ry., elec., Edinb. exhib. \* July 11 *Sc Am Sup*  
\* Aug 30 -**90**; aerial, Landun sugar works, France \* June 13 -  
**91**. See also ELEC., Portelec; ROPE driving; WIRE rope

**Tempel**, William, Schiaparelli *Sc Am Sup* July 13 -**89**

**Temperatures**, at various depths, L. Cochituate, Boston, diag.  
*E News* \* July 26 -**90**; absolute zero *R Gaz* Sep 30 -**92**. See  
also EARTH temps; THERMOMETERS

**Tennessee** and Ala. *Eng* \* Oct 5 \* Nov 2 -**88**

**Tesla**, Nikola, por. *El Wld* \* Feb 15 -**90**, and his business *Sc Am Sup* \* May 21 -**92**

**Testing** machines, aut. recording ap., Gray *Am M E* v 13 -**92**  
*Cassier's* \* Oct -**92**; the Emery, Towne *Eng* \* May 11-25,  
75-ton, inset \* July 6, dis., insets (full) *Inst M E* \* May, Oct, at  
Watertown arsenal *The Eng* Jan 20 -**88**

*Eng* Kennedy's 50-ton laboratory \* Sep 12 *The Eng* \* July 18 -**90**; hydr., 1200 tons capac., Phoenix I. Co., inset *E News* \* Jan 10; the Olsen and com. report *F Inst* \* Feb; alternative-center, Walker eng. lab., Liverpool, Hele-Shaw, insets *Inst M E* \* July -**91**

**Testing** materials, uniform methods, com. report *Am C E* v 26 -  
**92**; and sampling works, St. Louis *E & Min* \* Feb 11 -**88**; standard methods *E News* Mar 7, Aug 22; Kirk system, Hunt, Sept 19 -**91**; Malines Gov't. works, Belgium, Roussel *Inst C E* \* v 91 -**88**; metals, influence of time in, Bauschinger (full) v 107 -**92**; Charlottenburg station, Germany *R & Eng* Aug -**90**; labs., Master Mech's com. report *R Gaz* June 26 -**91**; repeated stress, expts., Sondericker *Tech Q* \* Apr -**92**. See also BEAMS;  
CAST iron; MATERIALS, inspection; STEEL, expts.

- Texas**, geological survey *E & Min* Apr 5-**90**
- Theatre**, Terry, Court and Garrick, structural ironwork in, London *The Eng* \* Feb 1-**89**.
- Thermic** motor of the future *Sc Am Sup* \* Apr 25-**91**
- Thermo-dynamics**, difficulty, Mansel cor. *The Eng* Nov 1, n 15-**89**, Bower cor. \* Aug 5, Sep 23 \* Dec 2-**92**
- Thermograph**, Draper's *Eng* \* Feb 14-**90**
- Thermometers**, mercurial, expts. to det. rate of rise or fall, Nagle *Am M E* \* v 13-**92**; new scale, Forbes *E Wld* Oct 12-**89**; correcting *Locom* Dec -**88**, Jan; Browne (full) *Sc Am Sup* \* Sep 14-**89**; calibration method at many points, Holman *Tech Q* \* Sep -**87**
- Thermo-motor**, the Hargreaves *The Eng* Jan 27; and heat engines, R. H. Smith, Feb 3-**88**
- Thomas**, Edward C. G. *Inst C E* v 99 -**90**
- Thomas**, Sidney G., bk. review *E & Min* Aug 8-**91**
- Thompson**, Silvanus P., por. *El Wld* \* Jan 9-**92**
- Thomson**, Elihu, por. (full) *El Wld* \* Sep 1-**88**
- Thomson**, James *Sc Am Sup* July 9-**92**
- Thomson**, William, por. *El Eng* \* Jan 13, por. *El Wld* 16-**92**, por. (full) *Sc Am Sup* \* Mar 9-**89**
- Thorman**, Edward H. *Inst C E* v 109 -**92**
- Thrashing** machine trials, Doncaster *The Eng* \* June 26, July 3, 10-**91**
- Thurston**, Robert H., por. *Cassier's* \* Nov -**91**
- Tide** gauge, aut. self-registering, n *E News* \* July 28-**88**
- Tides**, tidal volume, d'Auria *F Inst* \* Apr, law of variation \* May; range in rivers and estuaries, Gieseler, Aug -**91**; the bore of the Tsien-tang-Kiang, Moore *Inst C E* \* v 99; continuous util. of tidal power, Decoeur, abs. v 102 -**90** *Genie Civil* v 17 -**90**. See also **WAVE** motors
- Timber**, expan. due to water absorption, De V. Wood *Am M E* \* v 10 -**89**; preservation, ed. *Eng* Nov 21-**90**; use in eng. structures, Apr 1-**92**; mine tim. preserv. *E & Min* May 30-**91**; supply vs. R. consumption, Fernow *E News* Oct 25; preserv., Chanute, Dec 13, report (full) *R Gaz* Dec 12-**90** *Sc Am Sup* Feb 14, treatment *The Eng* Sep 11, creosote for, Jan 31; Gov't. tests, J. B. Johnson, Nov 28-**91**; preserv. *E Rec* Dec 20 -**90**
- Inst C E* expts., want of uniform system, Campbell, abs. v 92; creosoting in New Zeal., Sharp \* v 93 -**88**; in tropics, the

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teredo *Navalis* and White ant., James, v 103 -91; pine, strength *R & Eng* Apr -92; preserv., Reed *R Gaz* Sep 19, creosoting (full) Dec 26-90; Am., scientific study of, J. B. Johnson \* Dec 4-91; and some of its diseases, Ward (full) *Sc Am Sup* \* Mar 17, 24 \* Apr 7, 28 \* May 5 \* June 2 \* July 28 \* Sep 1, 22, 29-88. See also MATERIALS, strength; WOOD

**Time**, uniform standard, com. report *Am C E* v 26 -92 *R Gaz* Mar 29-89, Jan 29-92; and cost, short way to keep, Binsse *Am M E* v 9 -88; correct, Pritchett *El Eng* July 2-90; elec. distrib. of, A. D. Brown *El Rev* June 30 *F Inst* June, July, (full) *Sc Am Sup* Aug 18-88; Mayrhofer's system *El Rev* \* July 5-90; standard, Gov't. system, Gardner, July 30 *El Wld* July 2-92

*E Mag* old-fogy methods of reckoning, Fleming \* May -91; standard of, 24 o'clock system *E News* \* Aug 17-89; correct, simple method of keeping *Locom* Nov -88; standard and 24 hour sys. *R & Eng* May -89, uniform, May -92; convention *R Gaz* Apr 12-89, pro. Apr 11; new notation, Richardson *Sc Am Sup* \* Jan 11-90. See also R's, time convention

**Time** checking machine, the Llewellyn *E News* \* Nov 16-89

**Tin**, assay, influence of Columbite on, Carpenter *Am Min* v 17 -89 (contin. p 785); ores, dry assay, Hofman, v 18 -90 *Tech Q* May, Aug -90; alluvial deposits, Siak, Sumatra, Rolker (full) n p 772 *Am Min* \* v 20 -92; tin and the tariff, Fletcher *Bost Traveller* Oct 3-88; produc., ed. *Eng* July 18-90; world's store, Claypole *E Mag* \* Jan; tin plate indus. and English exports, n Mar -92 *Industries*

*E & Min* Dakota mines, Sep 15-88; mines, Malinon \* Aug 31; in No. Car., Ledoux cor. Dec 14-89; produc. Aug 30; San Jacinto mines, Cal., Benedict, Oct 18-90; in '89 Jan 4-90, in '90, Jan 3; in cen. Tex., Comstock, 24; tin plate manuf., Garrison, abs. Feb 28-91 *F Inst* Dec -90; recov. from tin plate scrap, new method, Schultz, abs. *Inst C E* v 102 -90 *E & Min* Mar 28; Bolivia mines, Minchin, May 16; U. S. tin plate indus. Dec 12-91; market, '91, Jan 2; ore concen. plant at Harney Peak, So. Dak. \* July 30, mines do. Nov 26, Dec 3-92

*E News* Am. mines, Emmens, Nov 24-92; produc. *Sc Am Sup* Aug 9-90; sources of, Merrill, Nov 28; hist. of discov. and use of, Flower, Dec 5-91

**Tin** plate cleaning machine, Davies' *E & Min* \* June 27-91

- Tires**, Munton proc. manuf. steel, Chic., inset *Eng* \* Oct 17-**90**
- Tobacco**, use of, anal. (effect) Bosworth *Sc Am Sup* Apr 27-**89**; (effects) Rochard, Sep 10-**92** *Pop Sci*
- Tools**, cast iron, for cutting metals, O. Smith *Am Min* \* v 19-**91**
- Torey**, Hamilton *Inst CE* v 98-**89**
- Tornadoes**, in U.S., Hazen, notes *E News* Apr 12-**90**. See also STORMS; WIND
- Torpedo** boats, the Halpine *El Rev* \* Oct 19; Sims-Edison fish \* Nov 16; Peral submarine, Webb *El Wld* Oct 19-**89**; Fatum, Italian, inset *Eng* \* Jan 20 *Sc Am Sup* \* Feb 25; 2d class, Yarrow *Eng* \* Apr 27-**88**; Donaldson, Feb 22; Spanish trials report, Mar 29, Apr 12, 19; seaworthiness of, Hovgaard, July 26; Ital. navy \* Dec 6; Brit. navy \* 20-**89**; Sunderland, b. with petrol. fuel, indic. diagr. inset, \* Jan 10, Mansel cor. 24, (full) *Sc Am Sup* \* Feb 22; Yarrow's, Dec 20 *Eng* \* Nov 21-**90**; Brazilian navy, sea-going \* Sep 18-**91**
- E News* the 'Cushing,' trials, Jan 2; U.S. navy, inset \* May 12-**92**; English *R & Eng* Feb, Mar; Nordenfelt submarine \* May *The Eng* Mar 16-**88**; Ital. navy *R & Eng* \* Feb -**90**; Baker submar. \* July -**92**; French, No. 110 *Sc Am Sup* \* May 4; No. 1, structural strength, Drake (full) \* June 29 \* July 6, correction, 13-**89**; Nibbio, Ital. \* Feb 1-**90** *The Eng* Mar 30-**88**; standard, Sep 20-**89**; Turkish Gov't. \* Jan 10; Tartar class \* Nov 14, ed. 21-**90**; French \* Jan 30-**91**, July 15-**92**
- Torpedoes**, the Howell locomotive *The Eng* Aug 17 *Eng* \* Jan 20; Berdan system \* Feb 3; Grenfell, ed. Apr 27; tor. attack, Jaques, Dec 21-**88**; the Victoria \* Aug 29 *Sc Am Sup* \* Oct 11; Whitehead & Howell aut., Ellicott *Eng* \* Nov 14, 28 \* Dec 19, 26-**90** *The Eng* \* Aug 7-21; Sims-Edison elec. *Eng* \* May 1-**91** *Sc Am Sup* \* May 3-**90** \* Mar 5-**92** *The Eng* \* Dec 18-**91**; Canet, discharge tubes (full) *Sc Am Sup* \* Sep 21-**89** *Genie Civil*; marine locom. *The Eng* Feb 24-**88**; the Lege \* Apr 12-**89**
- Torpedo** placing machine, the Fox *R & Eng* \* Feb -**92**
- Torpedo** thrower, aerial, Graydon air gun *Sc Am Sup* \* Dec 15-**88**
- Towers**, Egyptian, light, Minneap. exhib. *El Eng* \* Sep 17-**90**; Judson, 1600 ft. *Eng* \* Nov 15-**89**; London, great, proposed, ed. May 2-**90**; iron, Frankfort Elec. exhib. \* Aug 21; U.S. Columb., Chic., Morison's 1120 ft. \* Nov 20 \* Dec 18 *E News* \* Dec 5-**91** *R & Eng* \* Jan -**92** *R Gaz* \* Dec 4-**91**

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*E News* Lathing observ., N. Y., Crystal Pal. exhib., 1853, Nov 23; Douglass har., Isle of Man, Dec 7-**89**; braced iron, cor. \* June 21-**90**; wind strains in, graph. det., Steiner \* Mar 21; leaning, proposed, Halpenny cor. \* Apr 25; Hastings proposed, Columb. exhib., cor. Aug 1-**91**

*E Rec* water tower, Pullman, Ill. \* Dec 28; church spire framing and anchoring \* Jan 12-**89**, steeple \* Dec 20; London great, designs \* May 17, 24, prize \* July 5, Shaw's proposed \* Aug 23; iron clock tower construct. \* Dec 6, prize designs *R & Eng* \* Aug -**90**; U. S. Columb. exhib. n *R Gaz* Oct 23-**91**; tower of Babel, Kircher *Sci Am Arch ed* June -**88**

*Sc Am Sup* London great, proposed, designs \* June 7, 1250 ft., Davey \* July 19-**90**; Proctor steel, U. S. Columb. ex. \* Apr 4, oscil. beam, proposed, O. Smith \* May 30; Lond. Eiffel, Maxwell & Tuke design, n \* Aug 8-**91** *Bld News, Industries*; Lond., designs, 1320 ft. *The Eng* \* May 2, 1550 ft., Ende, 1300 ft., Woodcock, Fairfax \* 9, 9, 1250 ft., Davey \* 23 \* June 6, 1400 ft., R. H. Smith report \* 29, 1200 ft. Stewart (prize) \* 27, 1300 ft., Webster, 2d prize design \* July 4, 1300 ft., Graham \* Aug 15-**90**. See also CHIMNEYS; MONUMENTS; STAND-PIPES

**EIFFEL** Paris, 1000 ft. *El Wld* \* Apr 20; copyright, ed. *Eng* Apr 12; (full) \* May 3, compared with Forth br. \* 3; elec. plant \* June 21; lifts \* July 5-19; *E & Min* \* Feb 2; inset *E News* \* June 8-**89**; *E Rec* \* Dec 15-29-**88** \* Apr 13 \* May 18, 25 \* June 1-**89**; pressure gauge, Nansouty, abs. *Inst C E* v 105 -**91** *Genie Civil* \* v 18-**91**; lifts, Ansaloni, insets *Inst M E* \* July; *R & Eng* Mar; top of *Sci Am* Mar 9; *Sc Am Sup* \* Apr 27 \* June 15 \* July 6, 27; top of *The Eng* \* Jan 4-18, hydr. elevators, Roux \* Mar 22 \* May 10-**89**

**Towns**, new (boomed), failures in, Fleming *E & Min* \* Feb 13, 27, Mar 19, 26, Apr 2, 16, 30, May 21, 28-**92**

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*E News* N. Y. Cen. standard stone ballasted road-bed \* May 19; English, Tratman, July 7, Cunningham (Soc. pro.) Mar 16; the Servis tie-plates, 16, the Stuart \* Apr 27; imp., Tratman \* 27, July 20; track laying, cost, May 25; Dudley's inspection diags. \* June 15; Goldie & Fennerty's grooved spikes, holding power \* Nov 23-**89**

*E News* the Davies steel lock spike \* Apr 19; positive nut-lock, Jeffersonville, O. \* Sep 6: maintenance, Reed \* Aug 30, Hall, Dec 13; Bush interlocking bolts \* 20-**90**; B. & O. standards and rules \* Oct 31; rail section, So. Austral. Gov't. R. \* 31; spikes, tests of various forms, Cox, Dec 5-**91**

*E News* Young reversible nut-lock \* Apr 16; Haarman (German), bk. review, July 28; protect. against torrents and earth-slides in Sicily, Italy \* Sep 15; Prussian St. R's \* Nov 17-**92**; German & Austria-Hungary R's per. way, W: Worthington, abs. *Inst C E* v 95-**89**; double gauge, 3-rail turnouts for, Geddis (full) *R & Eng* \* Apr - July -**92**

*R Gaz* car wheels, axles and, N. E. R. Club dis. Feb 17; per. way, circular returns, Apr 13; mainten. (cost), Goodwin, May 4, Curtis \* Nov 16-**88**; stone ballast in India, May 3; Am., English and Indian practice, notes, Oct 11; track work, Nov 8-**89**; Jones safety nut lock, n \* Oct 3-**90**; longitud. bearings for, T. C. Clarke, May 29-**91**; N. Y., New Haven standard \* Jan 1; tie plates, Sandberg \* Mar 25; nut locks \* Nov 11-**92**. See also CROSSTIES; R's, curves — spikes — switches — U. S. construct; RAILS, joints — sections

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**Traction**, det., h. p. of tabulated constants, Crane *El Eng* Nov 19-**90**

**Traction** engines, England, descr. and construct., Fletcher *E News* \* Oct 27, ed. Nov 10, and steam road rollers, 10, \* Dec 1 -**92**; spring wheel *The Eng* Dec 7-**88**. See also ROAD engines; STEAM carriage

**Trade**, England and Am. relations, McCormick, ed. *Eng* Apr 8-**92**; Am. and foreign exports and imports *E News* Apr 14-**88**

**Trade-marks**, law of, Sebastian, bk. review *Eng* Dec 19-**90**

**Trade** schools, N. Y., work in, Mead *E Mag* \* Apr -**92**; J. Wilson *F Inst* Feb-Oct; N. Y. *Sc Am Sup* \* Dec 20-**90**

**Trade** unionism, new and old, Howell, bk. rev. *Eng* May 1-**91**

- Trade-winds**, cause of, Velschow, dis., insets *Am C E* \* v 23 -**90**
- Tramways**, Guinness' brewery, Georghegan *Eng* \* Oct 12, insets *Inst M E* \* July -**88**; the Hunt industrial *E News* \* June 16 -**92**; tramway wagon with steel rails, Wells, descr. *Lehigh Eng J* Apr; steam, for country districts *The Eng* Oct 26, Nov 16-**88**. See also R's. elec; STREET R's.
- Trans-Caspian** territory. See R's, Trans-Caspian
- Travertine** deposits, Mammoth Hot Springs, Yellowstone Park, Weed *E & Min* \* June 13-**91**
- Trellis** machine, steel *Eng* \* July 25-**90**
- Trench** brace, Dunn extensible *E News* \* July 7-**92**
- Trestles**, and pile structures, Western Am. R's, inset *Eng* \* May 20-**92**; C. B. & N. standard plans *E News* \* Apr 7, May 5, June 9; round timber, Burnt Br. creek, Vancouver, Klickitat & Yakima R., Habersham cor. \* 9; Norfolk & W. stand. plans \* 23; special features in wooden, cor. July 21; design of, ed. 21 -**88**  
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*R Gaz* safety of pile bridges, Apr 26-**89**; wooden bridges, Foster, Or. & Wash. Ter. R. \* Apr 25, Ft. Worth & Den. City stand. \* May 30, St. P. & Man. \* June 13, 27 July 18 Aug 1, 22 Sep 5, 19 \* Oct 31 \* Nov 21, 28 \* Dec 5, 12-**90** \* Jan 2, 30 \* Feb 13; Esquimalt & Nanaimo high \* Feb 6; Minneap. & St. L. pile and, Hixon cor. \* Apr 17; Intercol. R. of Can., deep water \* Oct 2; Halifax har. do., pile \* Dec 25-**91**. See also BRIDGES, floor-beams and pine stringers, Bates — pile; PILING; PILES
- Trickett**, John *Inst C E* v 95 -**89**
- Trigonometer**, Leschorn, diag. *E News* \* Nov 24-**88**
- Trigonometry**, graphical, Foster *E News* \* Aug 31-**89**
- Triple** thermic motor, Haswell *The Eng* June 1-**88**. See also THERMIC motor
- Trobe-Bateman**, Frederick F. *Inst C E* v 96 -**89**
- Trowbridge**, William P. *Am M E* v 13 -**92**, por. *E & Min* \* Aug 27, por. *Sc Am Sup* \* Nov 19-**92**

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**Tubes** and tubing, rolling from solid bars *F Inst Dec Locom Dec Sc Am Sup* Dec -**90** *Am M E* v 8-**87**; flexible metallic, Almond \* v 12-**91** *Eng*\* Jan 16-**91** *E & Min* \* Dec 6 *E News* \* Nov 15-**90** *R Gaz* \* Nov 15-**89** \* Nov 28-**90** *Sc Am Sup* \* Jan 10-**91** *The Eng*\* Oct 18-**89** \* Dec 30-**92**; spirally welded steel, Bayles *Am Min* \* v 16-**88**, v 19-**91** *E & Min* \* Apr 7, 14-**88** *E News* \* Mar 30-**89** *F Inst* \* Feb -**88**, abs. *R & Eng* \* Mar -**89** *Sci Am* June 16-**88** *Sc Am Sup* Nov 8-**90** *Eng*

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*E News* manuf. of copper by electricity, Elmore's Aug 9-**90**; spinning, shaping and welding metals, Bevington's proc., com. report *F Inst* \* Nov -**91**; spiral weld machin. development, Green, inset \* Mar -**92**; manuf., Robertson cor. *The Eng* Sep 28-**88**; tube making machin., Baracough \* Oct 23-**91**. See also **PIPES**

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**Walker**, Benjamin *Inst C E* v 105 *Inst M E* Apr -**91**

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**Walker**, Thomas A. *Eng* Nov 29-**89** *Inst C E* v 100 -**90**

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**Waring**, Charles H. *Inst C E* v 91, 92 -**88**

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**Washington**, D. C., st. imps. *E News* Oct 27-**88**. See also MUNIC. eng; PAVEMENTS; SEWERAGE; WATER-works, etc.

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*Eng* charges by measure and assessment, ed. June 29, ed. *E News* July 28, 28-**88**; ground, influence upon health, Latham *Eng* Aug 28-**91**; pollution and epidemics, Rafter *E Mag* May; impure and pub. health, Davis, Dec -**91**; Passaic river, chem. and san. inves., Wurtz *E & Min* Mar 22 \* Apr 12-26-**90**; tandem hoisting tanks, self-loading and dumping, for flooded slopes, Bowden \* Nov 7 *Am Min*, *E News* \* Oct 17 *E Rec* \* 10-**91**

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*E Rec* draining and filling, Russell, Dec 24-**87**; arched main over stream, Geneva, N. Y. works \* June 6: service pipes discharge, diag. and formula, Prov. \* Nov 7-**91**; 4-ft., laying, Brooklyn \* Nov 5-**92**; action of water on galv. iron, Nichols *J Assoc E Soccs. abs. Inst C E* v 92-**88**; suspended across Sarine river, Friburg, Switz., abs; cast iron, specs., com. report, abs; steel riveted, Duncan, abs. v 107, 107-**92** *Am W W Assoc* report; 5-ft., Lavergne *Genie Civil* \* v 19-**91**; detection of leaks in, notes, Francis *The Eng* July 13-**88**; tunnel, flex. joint steel pipes, Vyrnwy to Liverpool \* June 5-**91**. See also **PIPES**

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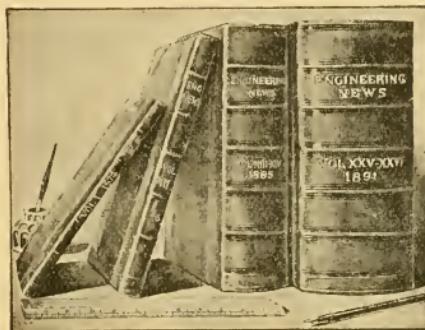
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